An Empirical Investigation of Price Rigidity in the Grocery Retail Sector

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ABSTRACT

Flexibility in prices is generally assumed to be a key factor in gaining competitive advantage in sectors like the supermarket grocery stores. However, changing prices frequently is a costly exercise for retailers. The degree of price rigidity is therefore determined by this need to respond to changing market conditions as well as the inherent costs of changing prices. This tension makes the degree of price rigidity of great empirical importance to marketers and economists. To this end, this thesis empirically explores price rigidity in the supermarket grocery sector. It investigates price rigidity using observational price data over a period of 52 weeks, across 11 categories including almost one hundred SKUs, and from three different stores in a Montreal area. Price rigidity is estimated both in temporary (sales price) as well as more permanent price changes (regular price). It also investigates asymmetries in price rigidities.

The general results show a surprisingly high degree of price rigidity with a higher rigidity in permanent price changes being complemented by a compensatory flexibility in sales prices. Prices remain unchanged for more than 9 weeks on the average for sales price, and more than 14 weeks on average for regular prices. We also find some evidence of asymmetric price rigidity, although limited and not statistically significant within the constraint of the limited dataset. The patterns suggest that both store and category level factors could be important sources of variation of price rigidity. This calls for more research into their respective roles.

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Chapter 1 Introduction

The term "price rigidity" describes the phenomenon when prices tend to remain unchanged over time. Price rigidity is also called price inflexibility or price stickiness. It is usually derived from the frequency of price changes. The most commonly used measure of price rigidity is the average length of time with no price changes, e.g. weeks, months, or years (Wynne, 1995; Caucutt et al., 1999; Sibly, 2001; Levy et al., 2002). In this thesis, I will explore price rigidity in the context of grocery retail prices by looking at disaggregate price data across stores, categories, brands and individual products.

There are several reasons why price rigidity is of interest to marketers. Frequent changes in the business environment may necessitate changes in the firm's marketing policies. Of the 4-Ps (Product, Place, Promotion, and Price) that are considered the general marketing parameters available for adjustment, price, arguably, is the parameter that is most easily changed. Little surprise therefore, that price is most often the tool used by firms to manage changes. Rigidity would imply, an unwillingness or inability to use price as such a tool. This creates tensions both in the market as well as within the organization. These tensions impact firm strategy and consequently, profits. This link between rigidity and strategy is of great interest to marketers (e.g. Müller and Ray, 2003; Ray, Chen, Bergen and Levy, 2004).

Economists are also interested in the phenomenon because of its implications for firm profit and consumer welfare (Levy et al., 1997; Cecchetti, 1986). If prices do not come down when they should (e.g. when seller costs go down and the lower costs are not passed

through to consumers), it can impact consumer welfare negatively (Müller and Ray, 2003). On the other hand, if prices do not rise when they should (when costs go up, for example), it might impact firm profit negatively.

Now, marketers in general tend to believe that being able to readily adjust to changing circumstances is a source of competitive advantage. Therefore, in a market characterized by intense competition, ongoing negotiations between suppliers and buyers, as well as shifting consumer tastes, it is reasonable to expect prices will adjust frequently. Yet, there are a lot of evidences that prices do not adjust so readily, that is they are rigid (Blinder, 1990). The purpose of this thesis therefore, is to calibrate the magnitude and identify some sources of variation in price rigidity in one of the most significant sectors of the economy – the grocery retail.

On a broader level, this study is in the tradition of the emerging new-Keynesian line of thinking. In neoclassical economics, prices are fully flexible. They represent the continuous optimization of economic agents and the continuous adjustment subject to market supply and demand. However, in the Keynesian models, prices are often assumed to be sticky. This means the price doesn't change or adjust fully subject to changes in supply and demand or business environment. This gap between the two approaches has generated significant interest going back a long time (Berle and Means, 1932; Blinder et al., 1998). The new-Keynesian models therefore have attempted to resolve the tension between the neoclassical price flexibility and the macroeconomic Keynesian price rigidity by turning their attention to the micro-level determinants of such rigidity. These models

draw their inspiration from several theories that either focus on structural inability to adjust prices (e.g. Ray, Chen, Bergen and Levy, 2004) or incomplete rationality (e.g. Chen, Ray, Levy and Bergen, 2004). Since the core principles of this approach focus on the micro-level determinants of a macroeconomic phenomenon, it calls for a greater accountability of micro-level price rigidity – a call made by such authors as Peltzman (2000).

Indeed, several authors attempt to document such rigidities at the level of individual economic agents (e.g. Levy et al., 2002; Müller and Ray, 2003 etc.). Unfortunately, the evidence is fragmented, often inconsistent, sometimes based on excessive aggregation of data, and also often incomplete in areas of specific interest to marketers. This study therefore, aims to take a fresh look at the issue of price rigidity from the point of view of a marketer and build on the previous works on the subject. In the following paragraphs I list in detail the specific contributions of this thesis to the literature.

First, while rigidity has a long history of research in economics debates exist about the construct itself. Authors such as Blinder (1990; 1991) pointed out the inherent ambiguity in the terms "rigidity," "sticky" and "flexible." Others such as Wynne (1995) question the theoretical basis of the construct altogether. Nevertheless, for marketers the significance and impact of the phenomenon is beyond question. In this thesis therefore, I adopt one consistent measure across all the different contexts studied – "the duration, in weeks, when prices do not change." The idea in this thesis is not to engage in a debate about the construct of rigidity. Specifically, I attempt to investigate the scale and scope of price

rigidity in a particular sector of the economy, i.e. the grocery retail industry, by looking at actual store price data in a Montreal area.

Second, the existing research is also somewhat ambiguous about the extent of price rigidity in the market. Going as far back as Mills (1927), questions have existed about the variation of rigidity across products. More recently, Carlton (1986) and Blinder (1990; 1991) find evidence that while there are many instances of small price changes, only a few (10% in Blinder's study) change prices as often as once a month. These conflicting observations, along with persistent questions regarding the sources of rigidity naturally call for more research that documents and calibrates the phenomenon across different industries and product markets. It is in this spirit that this thesis aims to contribute by looking at price rigidity in the grocery retail industry.

Third, most previous studies used highly aggregated data across several products or categories looking at a broad industry sector (gasoline, banking etc.). For example, Bacon (1991) used retail gasoline prices based on an average price of all grades of gasoline sold at many locations throughout UK. These aggregate data may hide the real underlying behavior of pricing decision. Few studies looked at actual transaction prices at the product or brand level. In this thesis I contribute to this literature by looking at actual posted price data to calibrate rigidity.

Fourth, even when researchers looked at transaction data (Slade, 1998), the difference between regular versus sale prices, was largely ignored. Yet, posted prices in stores often

have both regular and sale price information. Several marketing researchers have argued that the regular prices have a specific marketing purpose – to frame the consumer's reference price (Mayhew and Winer, 1992; Briesch et al., 1997). It seems reasonable therefore, that there would be differences in the underlying processes determining price rigidity across regular and sale prices. In this thesis, I look at price rigidity across both regular and sale prices. By doing so, I aim to bring a marketing perspective to the body of information on price rigidity.

Fifth, the extant research on rigidity is sparse in its documentation of rigidity in the retail grocery sector, some notable exceptions being Levy et al. (1997) and Slade (1998). This is somewhat surprising given that the grocery retail contributes more than US$1.1 trillion in 2003 (Euromonitor International, Nov. 2004) to the North American economy and is a necessary part of our daily lives. In this study therefore, I address this by focusing on retail rigidity in the retail grocery sector exclusively. I build upon Slade's study by considering a total of 301 SKUs (267 national brand SKUs across three stores + 21 store brand SKUs in Super C+ 11 store brand SKUs in Loblaws and 12 store brand SKUs in Provigo) in place of the 30 SKUs that constituted her sample.

Sixth, there are several theories that attempt to explain the existence of price rigidity. However, there are few research papers that explore the variation of rigidity across dimensions of interest to marketers – stores, categories, brands, or SKUs. In this thesis, I undertake a methodical examination of the sources of variation of rigidity across these dimensions.

Seventh, several studies (Ball and Mankiw, 1994; Borenstein and Shepard, 1996; Peltzman, 2000) consider the asymmetries in price rigidities – i.e. the phenomenon where prices are more rigid on the way down, than on the way up. There is general agreement that rigidities are asymmetric at an aggregate level. Yet, the evidence is often contradictory at more micro, disaggregate level. While Peltzman (2000) and Müller and Ray (2003) do not find evidence of pervasive asymmetry in retail prices, Chen et al. (2004) find that retail prices may be asymmetric depending on the magnitude of price changes involved. In this thesis therefore, I explore the evidence of asymmetric price rigidities by looking at patterns of price changes.

Last, but not the least, it is rare to gauge the accuracy of secondary data that report regular and sale prices. It is also rare to get data from multiple stores in a given locality. For example, Levy et al. (2002) uses secondary scanner data to conduct their study. In this thesis, I report data that I collected by hand, employing a strict criterion regarding what is considered regular and sale price. In this sense, my method is similar to Slade's (1998). Hence my data is largely accurate. Moreover, I collected data from three neighboring stores allowing me to explore store level variation in rigidity patterns.

The rest of the thesis is organized as follows. In section 2 I will provide a perspective of the existing literature on price rigidity by discussing the alternative explanations of price rigidity, empirical evidences, variation of rigidity, and asymmetry in price rigidity. In section 3 I will summarize the research objectives of this study in light of the previous sections. In section 4 I will explain the research methodology. In section 5, I will present

the results and analyses of this thesis. In section 6, I will discuss findings of this study, their implications for academics and managers, limitations and future research ideas.

Chapter 2 Literature Review

2.1 Alternative Explanations of Price Rigidity

Price rigidity has been a long-term warmly debated topic in economics (Mills, 1927; Means, 1935), and aroused great interests in the marketing area in recent years. The literature on the issue is quite fertile. However, there is still no consensus theoretical framework explaining why and to what extent the price should be rigid. In one way or another, many researchers have contributed quite a lot conceptual and theoretical effort on this issue. Nevertheless, most of them are actually not proved theories but some theoretical explanations on the topic of price rigidity (Blinder, 1998). The main theoretical explanations on price rigidity are presented below.

2.1.1 Menu Costs

One of the most acceptable explanations of price rigidity was the costs of changing prices that was introduced by Barro (1972) in his study on price adjustment. Barro argued that changing prices is costly. In a straightforward logic, the firm would not like to change its prices frequently in order to reduce operation costs. He identified two sources of these costs: (1) administrative costs, such as the costs of making the price change decision, the cost of printing new price lists, the costs of printing new labels, the costs of informing the salespeople, etc, and (2) informational costs, which include information and search costs

incurred by consumers.

In most cases, researchers pay more stress on the first category costs of changing prices (usually called "menu costs") while little on those on the consumer side. Levy et al.'s (1997) research using supermarket chain dataset conducted a detailed empirical study on menu costs. Their study showed that changing prices in those stores is a complex process, requiring dozens of steps and resources. The menu costs reported in their study are made up of: (1) the labor costs of changing shelf prices, (2) the costs of printing and delivering new price tags, (3) the costs of mistakes made during the price change process, and (4) the costs of in-store supervision of the price change process. According to their measurement, the menu costs average $ 105,887/year per store, comprising 0.70 percent of revenues, 35.2 percent of net profit margins, and $0.52/price change. Undoubtedly, menu costs take up a significant share of supermarkets' revenues and net margins. For some supermarkets facing item pricing laws that requiring a separate price tag on each item, menu costs should be much higher. In the context of causes of price rigidity, Levy et al. (1997) also demonstrated some empirical evidences: (1) a supermarket chain facing higher menu costs (due to item pricing laws) changes prices two and a half times less frequently than the other chains exempt from item pricing laws; (2) within this chain the prices of products exempt from the law are changed over three times more frequently than the products subject to the law.

Consistently, some other researchers postulate that retailers would internalize these menu costs every time they change the prices (Ball and Mankiw, 1994). Without any costs of changing prices, the retailer would adjust its current prices to the desired price following

each cost shock. However, when each price adjustment incurs a menu cost, retailers would not like to change their prices frequently. In this logic, the non-market clearing actually implies rational pricing behavior and economic efficiency.

2.1.2 Costs of Changing Prices on the Consumer Side

Changing prices is also costly on the consumer side. Just as Barro (1972) mentioned that changing prices forced consumers to incur information and search costs and other transaction costs for their new patronage combination. Therefore, consumers are more likely to stick with their current suppliers than to take their businesses elsewhere. Other researchers (Nishimura, 1986; Alchian, 1970; and Okun, 1975; 1981) have consistent argument that "costly changing prices makes customers willing to pay a premium to do business with supplies who pledge a constant price despite demand fluctuation, and this tendency is strong enough to make equilibrium prices rigid with respect to changes in demand at least in the short run".

From the viewpoint of a consumer, any additional cost incurred in the transaction process is actually similar to a price increase. Constant prices both save customers' shopping time and encourage them to look at a longer-run average price rather than the current spot price (Okun, 1981).

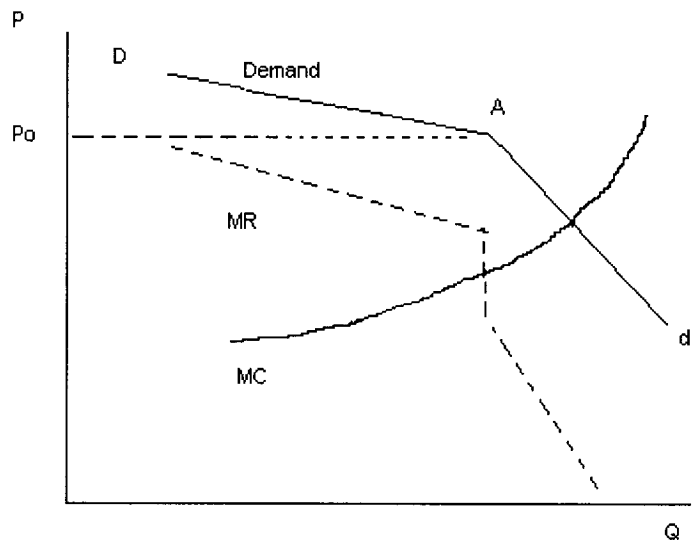
Konieczny's (1993) study on variable price adjustment costs provides support for this explanation of price rigidity. His study indicated that, besides fixed menu costs in price

changes, some variable price adjustment costs, i.e. consumer switching and unfavorable market reactions to price changes, are strongly related to price inflexibility.

2.1.3 The Kinked Demand Curve Oligopoly Theory

Perhaps the granddaddy of all theories of sticky prices argues that oligopolistic interdependence leads to a concave kink in the subjective demand curve facing an oligopolist (see demand curve DAd in the figure below). This theory was originated by the Oxford researchers Hall and Hitch (1939) and the economist Sweezy (1939) to explain the stickiness of "administered" prices in concentrated industries. Actually, the reasoning of this theory is simple. It argues that in the oligopolistic market if the firm lowers its price, it assumes that its rivals will match the price reduction, producing the rather inelastic demand curve Ad. Hence there is little to gain by cutting price. If, on the other hand, it raises its price, it assumes that rivals will not follow suit, leaving it at the mercy of the more elastic demand curve DA. So price increases might prove disastrous. The conclusion is that even substantial changes in marginal cost may not induce any change in price. Therefore, the oligopolists remain at point A in the diagram. This theory is also called FDNU (Follow Down, Not Up) model by some researchers because the primary assumption in this theory is that the prices follow decreases but not increases. This theory has long been paid considerable attention in the economics and a substantial empirical evidences bear on its validity (Blinder, 1998).

Figure 1 Kinked Demand Curve



P = price MR = marginal revenue

Q = quantity MC = marginal cost

2.1.4 Explicit and Implicit Contracts

Another explanation of price rigidity is the contract that is commonly adopted in the modern business deals. This explanation is probably the simplest "theory" of price stickiness because it simply hypothesizes that many goods and services are sold under contracts that fix nominal prices for finite period of time (referred to explicit nominal contracts). While the contract is in effect, prices are not free to adjust to either demand or cost shocks. Nominal explicit contracts are a mainstay of Keynesian macro models that

have long supposed that such contracts are an important source of price rigidity (Blinder, 1998). Strictly speaking, this explanation is actually not a "theory" at all. It is just a statement about the way things happen. The real explanation should be the underlying reasons that why buyers and sellers might wish to enter into long-term contracts (Blinder, 1998).

Implicit contracts are regarded as another contract explanation of price stickiness. In Okun's (1981) theory of "invisible handshake", implicit contracts are also assumed in the buyer-seller relationship. In fact, this is a variant on explicit nominal contracts inducing price rigidity. Okun argued that buyers and sellers who value long-term relationships may enter into implicit "contracts" under which, for example, sellers pledge not to exploit the situation by raising prices when markets are tight. In returns, buyers agree not to insist on price reductions when markets are slack. Undoubtedly, such implicit contracts will rigidify prices too. Okun also suggested that widely accepted notions of fairness would permit prices to rise whenever costs increase, especially if the costs increases were public knowledge. Hence he posited that prices would be much stickier after demand shocks than after cost shocks.

2.1.5 Price as a Symbol of Product Quality

This theory comes from the old theme that the price of a goods is the reflection of its inherent value and quality, which is predetermined by its design, materials, and production technology applied. Thus, in most markets, customers judge the quality of a product by its

price (Blinder et al., 1998). On this issue, Stiglitz (2003) provided supplementary explanation in the context of marketing based on the modern theory of imperfect information. He suggested that customers actually don't know the characteristics of the product they purchase very well because the consumers know little or don't want to know how the product is practically manufactured. Therefore, to consumers the product quality is unobservable, or at least has some important unobservable aspects. Consequently, they usually judge the quality of the product by the price of it. The higher priced commodities are of higher quality. Conversely, the lower price may be interpreted as a lower quality. In this logic, if the firm introduces a price cut on a product, the consumers might misinterpret the price reduction as a reduction in quality. In literature on modern marketing management, the price actually represents the quality of the product, name of the brand, and even reputation of the firm. In a sense, price is a symbol of everything within the product. And a stable price may enhance the credibility of the company and the price itself.

2.1.6 Psychological Pricing Points

Blinder et al. (1998) proposed a theory explaining price rigidity based on his interview survey on theories of price stickiness. As he stressed, this explanation is not from previous theoretical literature but rather suggested by practitioners. It postulated that many sellers, especially in the retail business, apparently believe that certain threshold prices – such as $29.99 for a shirt or $999 for a home computer- have special psychological significance to consumers. In economic term, the demand curve is thought to be extremely elastic at prices just above those points. For example, suppose a store selling shirts for $29.99 experiences a

small rise in marginal cost. If it thinks $30 is a psychological barrier, it may prefer to hold the price constant rather than raise it to, say, $30.15. At some later point, after several small cost increases have accumulated into something sizable, the price may be raised to, say, $31.99. This explanation seems quite reasonable since such pricing phenomena are prevalent in the actual pricing practices. It is known that retail food prices ending in 41 to 50 cents or 75 to 100 cents are more common than prices ending in other digits (Blinder, 1998). For example, prices ending in .99 are very popular in Canada and American retail prices. In China and some other Asian countries, 8 (implying fortunes) are commonly used in prices (e.g. .88, $88, or $888) whereas 5 (implying nothing) are usually avoided. It is sure that various psychological pricing barriers do exist due to the special tradition or culture in a particular region or country where certain digits have specific meanings or implications. It is still doubted whether such psychological pricing points may result in systematic lag of price adjustment (Blinder, 1998).

2.2 Empirical Evidences of Price Rigidity

Although price rigidity has a long history of academic interests in economics and marketing researchers are also highly interested to this issue recently. There are actually scant empirical evidences documenting how frequently the price changes (Wynne, 1995). There are only a few studies that make a serious attempt to document price stickiness.

The earliest study of the frequency of price changes was conducted by Mills (1927). He

studied BLS (Bureau of Labor Statistics) wholesale price data of 206 commodities during a period of more than 30 years (from 1890 to 1924). His results indicate that there are a lot of products for which prices change relatively infrequently, and there are also a lot of products for which prices change frequently. The distribution of price changes is specifically U-shaped. Therefore, there was no substantial evidence that products in general change prices infrequently.

Means (1935) conducted an empirical study on frequency of price changes (FPC) and magnitude of price changes (MPC) by looking at BLS wholesale prices for 784 commodities of 10 product categories over a period from 1926 to 1933. Based on this study, he introduced a controversially administered-price theory (AP theory), which suggests that most prices in the economy do not behave in a classical manner; rather they were administered through market power. This theory, for the first time, formally documented the existence of price rigidity that "prices could theoretically be relatively inflexible, rigid, or of contracyclical behavior".

Later on, Cecchetti (1986) checked the newsstand transaction prices of thirty-eight magazines over the period from 1953 to 1979. This is probably the most widely cited and influential piece of evidence that prices are sticky (Wynne, 1995). He found the prices of the magazines in the sample change relatively infrequently. At most, only half of the magazines change price in any one year (the peak year being 1974). He interprets this as evidence of "incredible" price rigidity.

Carlton (1986) revisited the BLS aggregate transaction price data of industrial commodities in the period from January 1, 1957 through December 31, 1966, which were collected by Stigler and Kindahl in their influential study of the behavior of industrial prices in 1970. He concluded that "the degree of price rigidity in many industries is significant". For instance, industries like steel, chemicals, and cement, Carlton found that prices remain unchanged for several years. Just as there are many examples of products and transactions whose prices remain fixed for long periods, so are there many instances of small price changes (less than 1 percent). And he found that there is a positive relation between price rigidity and the size of price changes, i.e. the longer prices are rigid, the greater the eventual price change. Of all the studies on price rigidity, this Carlton-Stigler-Kindahl study is probably the most comprehensive in that it looks at the prices of the largest number of products.

Kashyap (1991) conducted the most recent study documenting the behavior of transactions prices in a retail setting. Kashyap looked at the transactions prices of 12 retail goods from three retail catalog firms over the period from 1953 to 1987. Kashyap drew three main conclusions by his empirical analysis:

1. Nominal prices are typically fixed for periods longer than one year, and the time between price changes is very irregular.

2. Prices change more often during periods of high inflation but not by larger amounts than during periods of low inflation.

3. When prices do change, the sizes of the changes are widely dispersed.

Blinder (1991), adopting a different methodology from all the other empirical studies, conducted interviews with the actual price setters. Blinder argued that interviewing actual price setters in business firms may gain the most convincing insights into the factors that underlie decisions to change prices. Although the primary objective of Blinder's study was to find evidence that would allow us to discriminate between competing theories of price stickiness, his interview found most firms in the sample (55 percent) claim to change their prices no more than once a year, with only 10 percent of companies changing prices as often as once a month. Blinder interprets this observation as evidence of "significant" price rigidity.

2.3 Variation of Price Rigidity

While the price rigidity can't be explained by a definite theoretical framework and the empirical evidences are still not yet concrete, previous studies also demonstrate that price rigidity varies across industries, product categories, markets structures, firm sizes, periods of inflation, different price shocks, and even different size of price changes.

2.3.1 Price Rigidity and Product Category

Wynne (1995) studied wholesale prices (1890-1924) and found that a lot of products for which the prices change relatively infrequently, and there're also a lot of products for

which the prices change frequently. In industrial commodities, Carlton (1986) revealed that "The degree of price inflexibility varies enormously across products". Steel, chemicals, and cement have average rigidities exceeding one year while household appliances, plywood, and nonferrous metals have average price rigidities less than five months. Carlton further noted, even within a particular product group and transaction type, there is a high degree of heterogeneity in price rigidity. Consistently, Bils et al. (2003) found that "the frequency of price changes varies dramatically across goods". Prices of newspapers, men's haircuts, and taxi fares change less than once every two years on average. At the other extreme, prices of gasoline, tomatoes, and airfares change more than once a month on average. Hannan and Berger (1991), Caucutt, Ghosh and Kelton (1999) also agreed that durable products have relatively higher rigidity across different industrial product classes.

2.3.2 Price Rigidity and Market Structure

Stiglitz (1984) postulated that there is no compelling reason to believe a single theory that provides explanation of price rigidities in all markets. Their primary finding is that price rigidity is significantly greater in markets characterized by higher levels of concentration. Likewise, Hannan and Berger (1991), Caucutt, Ghosh and Kelton (1999) also revealed that seller concentration is an important factor explaining differences in price inflexibility across product classes. Consistently, Carlton (1986) investigated actual transaction prices between buyers and sellers in manufacturing. He concluded that the level of industry concentration is strongly correlated with price stickiness. The more concentrated the industry, the higher the average price stickiness.

2.3.3 Price Rigidity and Firm Size

Hannan and Berger (1991) studied banking industry and found that price rigidity differs across firm size. Smaller firms exhibit greater rigidity than larger firms do. In consistency, Stiglitz (1984) also found that smaller firms exhibit greater price inflexibility.

2.3.4 Price Rigidity and Inflation

Kashyap (1995) checked prices in retail catalogs and found that the time between price changes is very irregular; prices change more often during periods of high inflation but not by larger amounts than during periods of low inflation; and when prices do change, the sizes of the changes are widely dispersed.

2.3.5 Price Rigidity and Cost Shocks

Levy, Dutta and Bergen (2002) conducted a case study in the grocery retail sector, and found that prices exhibit more rigidity in response to the second shock than to the first one. Furthermore, three other findings suggest that (1) prices were more rigid in response to small cost shocks than to large shocks; (2) prices are more rigid in response to temporary cost shocks than to permanent shocks; (3) prices are more rigid in response to shocks on which there is limited information than to shocks on which there is more information.

2.3.6 Price Rigidity and Size of Price Changes

Carlton (1986) looked at the transaction prices of industrial commodities (BLS data). He found there was a positive relationship between price rigidity and the size of price changes. In other words, the longer prices are rigid, the greater the eventual prices change.

2.3.7 Price Rigidity and Length of Buyer-Seller Relation

Carlton (1986) also found price rigidity is interestingly related to length of buyer-seller relation:

1) There is a negative correlation between price rigidity and length of buyer-seller association. The shorter the length of association, the more rigid are prices.

2) There is a negative correlation between length of buyer-seller association and average absolute price change. The longer a buyer and seller deal with each other, the smaller is the average price changes when they do change.

2.4 Asymmetry in Price Rigidity

Asymmetry is another significant issue in price rigidity in recent years. Asymmetry in price rigidity (also called asymmetric pricing or asymmetric price adjustment) is actually a special case of price rigidity which implies that prices demonstrate more downward rigidity than upward. In other words, asymmetric pricing implies a variation of price rigidity between positive and negative price changes. In Ball & Mankiw's (1994)

definition, asymmetric price adjustment is defined as "prices are more flexible when going up than when going down". In the limited literature in marketing, Solow (1980) postulated that commodity prices are sticky downward. Some other scholars (Kuran et al., 1983) found that upward adjustments are generally more pronounced in frequency than downward adjustments. In the perception of consumers, price asymmetry is an inevitable outcome of marketers' greed, hence unfair; but to managers, it may be a fair profit-seeking behavior (Ray et al., 2003).

Theoretically, there is also no reasonable framework to explain this phenomenon. Some researchers (Stiglitz, 1979; Woglom, 1982) suggested that this is because consumers are faced with asymmetric (imperfect) information of prices between their regular firms and other firms. In Stigliz and Woglom's models, customers are attached to particular firms. Customers are well informed of the price set by their regular firms at each purchase, but are less frequently informed of the prices set by other firms in the market. If a price shock induces a firm to raise price, some current customers may switch to their preferred alternative firms. However, many others may not switch away due to higher switching costs. And because the price is increased, the risk of immediate margin loss is reduced. On the other hand, if the firm lowers prices, it will attract relatively few customers at first because prospective customers are not aware of the price change, and the firm doesn't increase its patronage. Therefore, price reduction doesn't guarantee an increase of the stock of customers, and may result in loss of revenue. As a rational and profit-maximization agent, firms would like to increase the price more or frequently rather than decrease it. Especially when the amount of price increase or decreases is small such

that it would not motivate the consumer to switch firms, the asymmetric price adjustment extensively exists. In a recent paper by Chen et al. (2003), they found empirical evidences that consumers are not sensitive to small price changes. Their results indicate there was a stable asymmetry for small price changes (less than 5% of product price) in almost all of the product categories they studied.

Empirically, while some studies (Bacon, 1991; Ball and Mankiw, 1994; Peltzman, 2000; Agular and Santana, 2002; Galeotti et al., 2003) provided sizable empirical evidences in support of the asymmetric pricing, others (Carlton, 1986; Karrenbrock and Carman, 1990; Kirchgassner and Kubler, 1992; Godby et al., 2000) found there is no obvious evidences that prices should be more rigid downward than upward. In most cases, the empirical evidences are highly varied or quite inconsistent for this pricing pattern. Sometimes they were contradictive. These are consistent with the arguments of several earlier researchers (e.g. Cagan, 1979; Okun, 1981) who argue that this issue is far from closed and hence calls for more studies on asymmetric pricing.

Chapter 3 Research Objectives of This Study

In light of the literature review, it can be reasonably concluded that price rigidity has been a long debated topic in economics and has aroused high interests in the marketing area in recent years. However, there are still a lot of gaps and ambiguities that remained for further exploration. The objective of this thesis is to address rigidity primarily in the domain of empirical calibration of rigidity in the grocery sector using a different research methodology. In the process, this aims to contribute to several aspects of the literature.

In particular, there seems to be no consensus on why price is rigid. Although quite a few researchers have proposed the theoretical frameworks, as a matter of fact, the debate rages on whether these are convincing or plausible explanations competing with each other or if there is a larger framework of which these are a part. More studies are necessary in order to provide empirical support for existing theoretical explanations and contribute to new theoretical development.

Secondly, the empirical evidence of rigidity is fragmented. While some studies showed substantial price inflexibility, others didn't show as much. Even in the same study, there are many cases in which prices stayed fixed for long periods, and there were also many instances in which prices were very flexible. For example, Mills's (1927) U-shaped distribution of frequency of wholesale price changes in the pre-World War II period demonstrated that there were a lot of products for which prices changed relatively infrequently, and there were also a lot of products for which prices changed frequently.

Carlton also founds many instances of frequent and small price changes in the Stigler-Kindahl data set, and Blinder observed that about 10 percent of the firms in his sample changed their prices as often as once a month. More carefully conducted studies are needed to verify the scale of this phenomenon.

Third, there is significant variation in explanatory factors that makes interpretation of the degree of price rigidity difficult. Consider for example, menu cost which relatively speaking is the most commonly accepted explanation for price rigidity. A meaningful comparison of price rigidity across different context and studies become difficult if there are inconsistencies in the estimation of menu costs. Situations with similar menu costs should lead to similar rigidity patterns. However, because of inconsistent definition and measurement the empirical outcomes of the menu cost literature are highly varied. In studies conducted with supermarket retail price data, Levy et al.'s (1997) research figured out $0.52/price change, comprising 0.70 percent of revenues; Slade (1998) on the other hand, conservatively estimated menu costs of about $3 per price change. Blanchard and Kiyotaki (1987) studied menu costs in a monopolistic situation and estimated that menu costs accounted for only 0.08 percent of revenues. Additional studies on price rigidity adopting consistent constructs and measurements are therefore needed to establish if there is a similar degree of variation in rigidity estimates across different context. If the rigidity estimates are relatively stable, it will further highlight the need for the menu cost literature to consider different factors that may impact menu costs, and explore other estimation technique.

Fourth, most previous studies used highly aggregate data across several products or categories looking at a broad industry sector (e.g. gasoline, banking etc.). For example, Bacon (1991) used retail gasoline prices based on an average price of all grades of gasoline sold at many locations throughout UK. The most popularly employed data are from BLS of USA most of that are aggregate list price data. And few of them looked at actual transaction prices at the product and brand level. Those aggregate data may hide the real underlying behavior of pricing decision. Undoubtedly, adopting disaggregate data, reasonable methodology or research design is meaningful to verify the existence of price rigidity. In this thesis, I will use highly disaggregate actual retail price data at SKU and brand level.

Fifth, the existing empirical results indicated that price rigidity was highly varied across industries, firms, markets, product, brands, and even sizes of price changes. However, the number of studies focused on the retailing sector was very rare. Levy et al. (1997; 2002) and Slade (1998) are the only few contributing to the investigation of price rigidity in the grocery retail sector. There were no comprehensive studies on price rigidity in this industry. In Levy et al.'s (1997) study on magnitude of menu cost in the grocery retail sector, they found the cost of each price change amounted to $ 0.52. In Levy et al.'s (2002) on heterogeneity in price rigidity, their results documented the variation of price rigidity, which may shed light on causes of price rigidity (Gordon, 1981). Slade (1998) made a contribution to exploring the fixed and variable costs of price adjustment in the grocery retail sector. Slade used highly aggregate data of weekly retail transaction prices of 30 SKUs in a U.S. small town. She found that price remained unchanged approximately 80%

of the time, and the average rigidity in these grocery retail prices is 5 weeks. This was possibly the only result concerning the scale of price rigidity in grocery retail sector. Undoubtedly, more studies are called to investigate this pricing pattern in the grocery retail industry.

In view of a great deal of gaps and ambiguities that remain in the issue of price rigidity in both theoretical and empirical aspects, many researchers, such as Ray and Muller (2003), Peltzman (2000), Blinder et al. (1998), Borenstein et al. (1997), and Ball & Mankiw (1994), all suggested the need for further theoretical development and empirical investigation in different sectors to calibrate this heatedly debated pricing phenomenon. In particular, marketing has not yet contributed to this effort in any significant way. There are very few studies focusing on the grocery retail sector although it is a very important sector characterized by intense competition and frequent price changes (Levy et al., 1997).

Based on those considerations mentioned above, I attempt to investigate this phenomenon in a grocery retail setting, and try to identify possible variation of price rigidity which may provide sources or better understanding of this pricing pattern. Trying to avoid weaknesses in previous studies and capture as much as possible of the real picture of this pattern in the grocery retail sector, I will employ highly disaggregate and personally collected price data. Most previous studies used scanner data, and often only list price or transaction price data. In this thesis, I will examine both regular and sales prices so as to explore different characteristics of price rigidity that possibly exist in these prices. At the meantime, I will try different research design and methodology in this study.

Chapter 4 Research Methodology

4.1 Research Design

Grocery Retail Setting

Grocery retail industry is a very important sector for pricing behavior studies because intensive market competition, frequent price changes and various pricing behaviors exist in this sector. In the reality, grocery retail stores are the terminals crowded with hundreds of thousands of consumer products. In general, a supermarket may carry more than 5000 brands and about 25000 products at any given time (Levy et al., 1997). Most products such as household appliances, regular foods, fruits, and vegetables are everyday necessities for consumers. Daily consumer visits in a supermarket are on average more than hundreds or even thousands. The competition is extremely fierce. Even in a small community, there are many competing grocery retailers. In Canada, it is common to see many large scale supermarkets, such as Loblaws, Metro, Super c, Provigo, IGA, PA, are crowded on the same street or in the same shopping mall. Just as Levy et al. (1997) mentioned: "in comparison to other sectors there are fierce competition and more frequent price changes in the grocery retail industry".

Due to most grocery products are daily use ones, high rate of repeat purchases exists in this

sector. Thus the grocery retail sector is often defined as a repeat-purchase market. A loyal relationship between consumers and grocery retailers is crucial to business success. In any way, this relation can be built easily, and destroyed easily, too (Sibly, 2001) because of intense competition and more available options. In this sector, consumers relatively have more knowledge of competitors' prices than in other sectors. Therefore, the consumers are much more sensitive to price changes and the retail pricing should be highly tactical in the grocery retail sector (Sibly, 2001). Unusual competition, consumer sensitivity, and requirement of tactical pricing lead to highly diversified pricing strategies pursued by grocery retailers. In the real word, a consumer may find there are obvious different pricing strategies applied in different supermarkets and in different product categories in the same store. This sector may provide a good agent for examining various pricing strategies and uncovering the underlying behavior in price decision making.

First-Hand Price Data

Most previous researchers usually used secondary data (e.g. scanner data) bought from stores or marketing research companies, or archive data from government agencies (e.g. BLS). One obvious deficit of these kinds of data is that the researchers themselves don't know the data and related information very well. The second shortcoming is that most data have a long span of period of time, for example, some data (e.g. Mills, 1927; Kashyap, 1991; Wynne, 995) having a time span of more than 30 years. Obviously, during such long time span of data collection, the internal consistency in the data is doubted. One reason is that during such long period, pricing behavior or patterns within the data the researchers

would like to uncover may be critically changed due to the changes of social and economical conditions, or even the shifts of managers. Another reason is that the quality of the same product may have significantly changed, which would lead to appropriately inconsistent pricing pattern for this product. According to Wynne (1995), if the changes of price are not caused by costs, demand or supply, but by the changes of product quality, we can't capture the real underlying pricing behavior. The third deficit is that it is not possible to randomly find these data with such long period of time span. In this sense, the representability of these data is reduced.

This study is a structured observation design. Not like the previous studies, we use the real first-hand data. I observed and recorded the price changes personally. In the process of data collection, I can actually feel the underlying changes of prices during my direct observations and data recordings. I also pay attention to the related information of the data at the same time. The data collection is completely designed and controlled in accordance with the research objectives. For this study, I collected data for more than a hundred of products or SKUs in order to provide a much larger sample than a few brands in previous studies. The whole time span of the data collection is exactly one year (52 weeks), which is long enough to cover seasonality patterns, yet short enough to ensure that there have been no significant changes in product quality and minimizing the effects of inflation.

Highly Disaggregate Data

Most previous studies employed highly aggregate data across several products or

categories looking at a broad industry sector (gasoline, banking etc.). In this thesis, I am going to use highly disaggregate data at SKU and brand level which are of great importance for marketers setting prices. I collected data from three typical types of grocery retailers, i.e. Everyday Low Price store (EDLP), High and Low Price store (Hi-Lo), and discount store in order to investigate effects of different pricing strategies in these store types. The time span of data collection (weekly visit) is precisely the span of time over which stores are committed to their pricing decisions. This high disaggregation across products, stores, and through time means that both long and short-run dynamics may be captured (Slade, 1998). Studies that use more aggregate data, in contrast, can fail to detect these effects when they disappear in the averaging process. And we don't use unit prices but the actual regular and transaction prices. The actual prices most closely resemble the data envisioned by the cost of adjustment theory (Lach and Tsiddon, 1992). Our study also selected close locations for these typical stores so as to examine the competition effect that is possibly very strong among them. In one word, this study tries to capture all the aspect of dynamics and origination of pricing behavior in these stores in order to uncover the real nature of price adjustment underlying the price decision making.

Similar Competition and Consumer Demographics

Since pricing behavior of firms are dependent on competition and consumer demographics, a multi store study like this needs to ensure these factors are similar in order for a meaningful comparison. This study therefore selected three proximal locations for these typical stores. The geographical proximity ensures that consumer demographics are similar

and that each store competes with each other. An additional benefit is that this proximity ensures a high level of between store competitions. Since rigidity is often argued to be detrimental to competitiveness, our findings on rigidity are likely to be strong results, therefore.

Examine Both Regular and Sales Prices

In previous studies, researchers often used only regular or transaction price data in examining pricing behavior. No one has ever applied both regular and sales price data in the same study. In this study, I will examine both regular and sales prices and try to find out whether there is a significant difference between their underlying pricing behaviors (or pricing patterns), and if a difference, how it will affect the overall pricing pattern for a store. In so doing, we can also figure out why previous studies showed inconsistent or even contradictive results in their pricing behavior investigations.

The regular price is the normal price showed on the shelf or on the package. Primarily, the regular price captures the relatively permanent pricing behavior underlying the decision making. On the contrary, the sales price which contains the temporary sales or promotions captures more temporary pricing behavior. Particularly, in the grocery retail sector where much more temporary promotions are possibly applied, the sales price may contain more temporary pricing behavior. Therefore, in this study our primary attention will focus on examining the regular price. Meanwhile, we also examine the sales price because the sales price is what the consumer really pays, which may capture some real nature of pricing

behavior.

From the perspective of affecting factors in the price decision making, firm, competition, and consumer are all critical factors, and always have highly interacted effects in the price decision making process. According to (Nagle and Holden, 1994), the firm is the price –maker whereas the consumer and competition constitute the pricing environment factors. As a price-maker, pricing behavior primarily reflects the firm's benefits and concerns. However, in the practical pricing process, the firm has to take serious consideration of pricing environmental factors, price-takers, the consumers, and price-competitors, the rivals. Particularly in the highly competitive grocery retail sector, the consumer and competition factors often have important impacts on the firm's price decision making. Sometimes, the consumer s and competitors are the priorities in pricing strategies. In this sense, the regular price may reflect more effects of the firm factor while the sales price reflect more effects of the consumer and competition factors. By examining both regular and sales prices, we expect to obtain a relatively more complete picture of pricing behavior underlying the firm's decision making.

Examine Both National and Private Brands

Previous studies rarely discriminate the national and private brands, or they usually didn't mention whether their samples contain private brands. This can be for many reasons, one being the relatively less importance of private labels in the past. In the current times, especially in the grocery retail industry, private brands are becoming more and more

popular (Hill, 1999), especially in large supermarket chains. Primarily, private brands are designed and manufactured according to the retailer's specifications. In a sense, they are the firms' "own" brands. Thus, the production, promotion, and price strategies may be quite different from the national brands. Investigating the specific nature of private brands and their different price strategies will be very meaningful in uncovering the variation of price rigidities across brands, and definitely enrich the literature in marketing research.

In this study, I collected continuous data for total 267 SKUs (89 common brands in each store) for national brands, and total 44 SKUs for private brands. Considering national brands still dominate the grocery retail industry, this study primarily focuses on examining price rigidity of national brands. Private brands are investigated in a separate part in this study such that a comparison between them is easier.

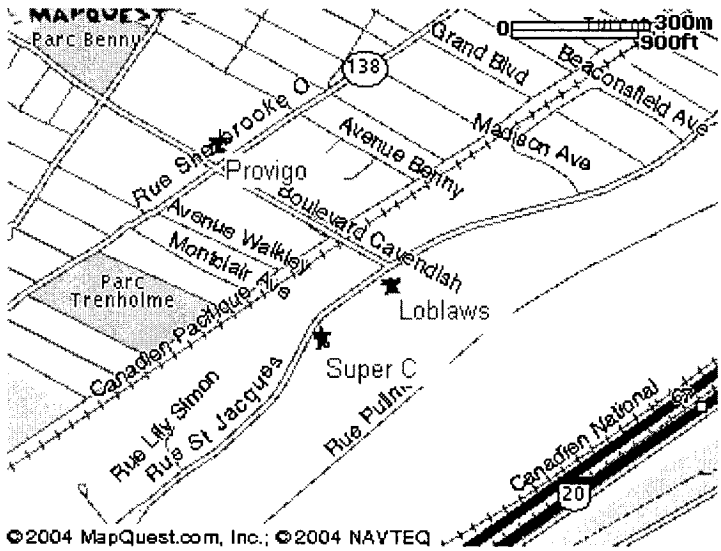
4.2 Sampling

There are varied sizes or scales of grocery retailers in Montreal. In Canada, the grocery retail sector includes different level of stores: depanneurs, independent stores, authorized stores, and large supermarkets. However, the small size grocery retailers are not what we are primarily interested because they may have unstable stocks of products, varied product categories, incomplete price management, and usually changeable pricing pattern. In this study, I mainly investigate the large scale supermarkets which have relatively systematic pricing policies or strategies, stable product sources, and complete information resources.

For the convenience of data collection, I sampled in a Montreal area. In this city, there are several large-scale supermarket chains, such as, Loblaws, Provigo, Super C, Metro, Supermarche, IGA, PA. Finally, Loblaws, Provigo, and Super C were selected as the store sample for this study.

In particular, these three supermarkets are representatives of three typical pricing strategy types in the grocery retail industry. Loblaws is the largest grocery retailer in Canada since 1990's. It is the representative of EDLP store. Most of its products adopt an Every Day Low Price strategy. Under the EDLP strategy the retailer's prices are low for an extended period of time, and it will offer fewer promotional sales or discounts (Levy et al., 1997). Provigo is a representative of Hi-Lo store. Under this pricing strategy, in contrast, the retailer's prices are higher, and the retailer tends to offer more frequent discounts through sales and promotions (Levy et al., 1997). Super C is a discount supermarket. This store also offers frequent sales or promotions. But, in the meantime, it would try to decline its operation costs in order to keep the competitive advantage. Thus, discount stores are more sensitive to menu costs/ costs of price changes compared to non-discount stores like Provigo. By selecting these three typical stores with different pricing strategy types, we may examine how price rigidity is related to these typical pricing strategies or store types. These three supermarkets are mainly around Boulevard Cavendish between Rues Sherbrooke and St. Jacques in NDG district. See their address map in the following:

Figure 2 Sample Store Map



Super C:

6900 St-Jacques, H4b 1V8, Montreal Tel: (514) 484-3136

Loblaws :

6600 St-Jacques Ouest, Montreal, H1A 1A1 481-6959

Provigo:

6485 Sherbrooke O., Montreal, QC H4A 1N3 488-5521

4.3 Data Collection

The data collection is a relatively labor intensive process. It is a manual data collection by regular (weekly) visit to these stores in the period from July 30, 2003 to July 23, 2004. According to the preliminary investigation, for most of the SKUs these stores undertake their price changing activities on a weekly basis. Although they may change the price of one SKU more than once within a week, such incidents are not a significant part of the pricing. It is more likely that they may spread out the price change activities over several days over several SKUs. For the SKUs advertised in flyers, they may change their prices on Sunday night or earlier Monday morning. For most of the others, each store mainly

changes the prices intensively in a certain day, for example, Super C changes most of its prices on Tuesday. Loblaws conducts most price changes on Monday, and Privigo on an irregular basis (Monday, Tuesday, or Friday). Given these, and because a daily price collection would impose a very high cost, we decide to undertake weekly price observations. According to my preliminary observation before the data collection, I found Friday is the best day for data collection in order to capture most of the price changes within a week in these stores.

Basically, I fixed the starting time of data collection on every Friday, the visiting route among these stores, and walking route within a store so as to minimize bias possibly caused by changes in data collection process. At 9:30 am every Friday, I start from home, beginning with Super C, followed by Loblaws, and Provigo. Normally, I can finish the data collection late in the afternoon (around 4 PM). In order to record as much as possible related information on the same day of data collection, I kept on taking diary every Friday night, recording questions on the data of the very day, new findings from the direct observations during the daytime data collection, and other interesting events or coincidences I met that day in the store.

The data collection lasted for exactly one year (52 weeks). In total, I collected data for 11 popular grocery categories containing 132 products (SKUs). Of the 132 products, 99 products belong to common national brands. 21 products belong to private brands in Super C. 12 products belong to Loblaws and Provigo store brands (Loblaws and Provigo belonging to the same company, thus having the same private brands). During the one year

period of data collection, data of some products were discontinued because these products were out of stock or not on the shelf any longer for one reason or another. In order to examine as complete a pricing pattern as possible, I deleted data for all discontinued SKUs in this study, and only investigated SKUs with continuous data during the 52 weeks period. Finally, a data set for SKUs of 89 common (11 categories) national brands, 21 Super C store brands (8 product categories), and 11 Loblaw store brands (6 categories) and 12 Provigo store brands (6 categories) were adopted for analysis in this study. Nevertheless, the sample size in this study is still much larger in comparison with previous studies (e.g. Slade only used 3 brands with a total of 30 SKUs in her study). There are roughly 40,560 observations or price data collected by hand in the 52 weeks. For the national brands, there are total of 27,768 (89×52×3×2) usable observations for regular and sales prices in these stores. For Super C store brands, there are 2,184 (21×52×2) usable observations for regular and sales price together. For Loblaws store brands, there are 1,144 (11×52×2) usable observations for regular and sales price in total. For Provigo store brands, there are 1,248 (12×52×2) usable observations for regular and sales price.

4.4 Experimental Control

In order to examine the variables that have significant influences on price rigidity, other insignificant variables are controlled as much as possible. In this study, I particularly have interest in the impact of the three typical pricing strategy types, variation of price rigidity across stores, product categories and brands. For this purpose, other influencing variables

are strictly controlled.

Consumer Demography and Store Location Control

Consumer demography, undoubtedly, has important impact on pricing. Different consumer demography implies different market segmentation and requires different marketing communication for a market-oriented store. Different consumer demography may lead to very different pricing strategies applied by the retailers. In general, consumer demography is highly related to geographical locations. For example, consumer demography in Westmount (populated by more so-called rich people and generally non Francophone) is probably different from that in Laval (generally more Francophone). In order to avoid significant influence of consumer demography, it is not a good choice to select one supermarket in Westmount and another one in Laval. In this study, I selected three stores in the same community, and they are quite close to each other. The distances between each other are less than 1000 meters (see their location map). In this way, I expect to minimize the effect of consumer demography.

Competition and Store Location Control

Like consumer demographics, competition is also a factor that impacts store pricing strategy and hence may affect the degree of price rigidity. Generally speaking, selecting the three main competitors that are in close proximity to each other ensures that each face a

high level of competition. Because it is intuitive to argue that competition will force firms to be less rigid in their prices, estimate of rigidity in such a high competition situation is likely to be more conservative. In addition, the comparison of price rigidity of a store facing very high competition with the price rigidity of a store facing very low competition may therefore, not be quite appropriate for a study where that is not the objective, by selecting competing stores in the same location, the possibility of variation in competition is controlled for.

Similarity of Store Sizes

Size of a store also has significant impact on pricing strategy. A large scale supermarket with large stock capability, high circulation rate, and stable goods resources may employ very different pricing strategies from a small-size store. In order to control the impact of this minor variable, similar sizes of stores are selected. In this study (see Table 1), the three supermarkets have the similar total areas (including parking lots) between 35, 000 and 42,000 square meters based on personal measurements. They have total number of SKUs between 20,000 and 30,000 based on Levy et al.'s (1997) study on similar sizes of supermarkets. According to informal interviews with the store managers, these stores have total employees between 80 and 120. Although we don't have accurate information of annual sales of these three stores, based on related store reports, they have annual sales around 20 million.

Table 1 Sample Store Specifications

Store	**Total Area (m^2)**	**Total No. of SKUs**	**Total Employees**
Super C	35, 000 – 42, 000	20, 000 - 30,000	80 - 120
Loblaws	35, 000 – 42, 000	20, 000 - 30, 000	80 -120
Provigo	35, 000 – 42, 000	20, 000 - 30,000	80 -120

Same Categories and SKUs across Stores

In order to increase comparability, price data for 11 common product categories of national brands across these stores were collected. Eventually, data for 89 common SKUs are used in this study (see Appendix 1 Product Categories and SKUs). The same categories and SKUs sampled in these stores will enhance comparability of price rigidities across these three typical store types.

4.5 Statistical Methods

The raw data collected are the actual prices demonstrated on the shelf or on the label of

product package. For the sales price, there is additional label with outstanding marks (e.g. large size red color label, with "special" or "prix reduit" (French) printed on it, etc.). The fundamental data used for analyses are the frequency of price changes, which can be easily calculated by Microsoft Excel.

After working out the frequency (number) of price changes, average weeks with no price changes for each SKU can be derived from that. For the analysis of price rigidity, descriptive statistics in the statistical analysis software is enough to figure out the average price rigidity for each SKU. Based on this, price rigidities at aggregate, store, product category, and brand level can be calculated. For the analysis of asymmetry in price rigidity, t-tests assuming equal variances are adopted across analyses at different levels.

Chapter 5 Results and Analyses

In this study, I specifically focus on a particular sector that has not been seriously studied by researchers in the context of marketing. The primary purpose of this study is to explore how rigid (to what scale and scope) the price in the grocery retail sector will be. There are very scant studies contributed in this sector. In a research on fixed and variable costs of price adjustment, Slade (1998) found that the transaction prices of three brands of saltine crackers in 10 stores, on average, changed prices in every 5 weeks. However, because of the small sample of brands selected and the small number of SKUs in her sample (30 SKUs in total), it is not clear how generalizable this finding is. Another main purpose of this study is to investigate sources of variation of price rigidity. Studying this issue is important because understanding sources of price rigidity may shed light on the underlying theoretical bases of price rigidity (Gordon, 1981). Previous studies suggested this pattern be varied across industries, firms, markets, product categories, and brands. In this study, I am particularly interested in such variations across grocery store types (or pricing strategy types), product categories, brands (private vs. national), and asymmetry (price increases vs. decreases).

For these purposes, I will examine price rigidity in both regular and sales prices at different levels: aggregate average price rigidity across stores, price rigidities in stores, price rigidities of product categories across stores, price rigidities of product categories in stores, asymmetry in price rigidity, and price rigidity for private brands.

5.1 Average Price Rigidity across Stores

This section presents the aggregate average price rigidity in the grocery retail sector (across three stores). There are no adequate empirical evidences on how rigid the price in the grocery retail sector is or what is the average price rigidity in this sector. As marketing researchers or common consumers, every week without an exception, we will receive a full package of grocery retailing flyers. This usually misleads us to imagine that the grocery retailers change their prices every week. Although Slade also discovered a 5-week price rigidity based on examining three grocery retail products in her study, in this study, after examining 89 common national brand SKUs in three typical supermarkets in a Montreal area, we found that the price rigidity in this sector is much higher than either a weekly change or Slade's 5 weeks. In these stores, the aggregate average price rigidity is as high as 14.20 weeks for regular price and 9.03 weeks for sales price (see table 2). In other words, the regular prices in the grocery retail sector in a Montreal area are changed in more than every three and half months, and the sales prices are changed in more than every 2 months. These results are both far away from Slade's 5 weeks of price rigidity in transaction prices. In view of the much larger sample in this study, in a direct comparison, my results should be considered more representative of price behavior in the grocery retail sector. We also notice that, for both regular and sales prices, variations around mean rigidities are as small as 5.0% (std. error 0.71) and 6.2% (std. error 0.56) respectively. This indicates that these results have high statistical validity and internal consistency.

Table 2 Aggregate Average Price Rigidity across Stores

Type of Prices	**No. of SKUs**	**Price Rigidity (weeks)**	**Std. Error**	**Percent Variation**
Regular Price	3 x 89	14.20	0.71	5.0%
Sales Price	3 x 89	9.03	0.56	6.2%

One thing noticeable is that the price rigidity of regular price is much higher than that of sale price (14.20 versus 9.03 weeks). This has a very meaningful indication. Because the only difference between regular and sales prices is that the sales price contains temporary promotions, the explanation is that grocery retailers frequently apply promotions in sales prices such that the sales price includes many cases of promotional price changes. If we check total cases of promotions in the transaction prices in these stores, this explanation is obviously supported. For the 89 products in these stores, total cases of price decreases in sales prices are 1198 during the period of 52 weeks. Total cases of price decreases in regular prices (regular price decreases) are 615. Therefore, total number of promotional price decreases conducted during the sample period is 583 (which equals to the number of prices decreases in sales prices minus regular price decreases). The percentage of promotions in total price decreases in the sales price is as high as 48.7% (see table 3). This means in the transaction prices almost half of price deductions are conducted in the form of promotions.

Table 3 Promotions in Transaction Prices

Total SKUs	Total Price Decreases In Transaction Prices	Total Price Decreases In Regular Prices	Total Promotional Deductions	Promotion Percentage
3 X 89	1198	615	583	48.7%

Such high promotion percentage applied in transactions prices give us an immediate indication of a dynamic price adjustment: on the one hand, grocery retailers would not like to change price frequently because of the costs of changing prices, or would like to keep a higher regular (or reference) price; on the other hand, they have to introduce promotional deductions frequently so as to make dynamic price adjustments in response to changes in business environment (e.g. increased competition, shifting consumer tastes, changes of social or economic conditions).

According to Ray et al. (2004), price and promotion are often highly correlated, especially when promotions are exclusively in the form of discounts in one form or the other (in-store reductions, coupons etc.). Of the 4-Ps (Product, Place, Promotion, and Price) that are considered the general marketing parameters available for adjustment, price and promotions are often the most amenable tools used together by firms to manage changes because ready adjustment to Product and Place are onerous tasks given the large fixed investments in capital and relationships involved in both. Not surprisingly, in a sector with intense competition, price is often adjusted with temporary promotions such that the firm can make flexible and dynamic reactions to external changes.

5.2 Price Rigidities in Stores

In this section, average price rigidities at store level are demonstrated. See table 4, the third column represents the average price rigidities of regular prices and sales prices in these stores. The fourth column shows the standard errors of these means price rigidities. The fifth column includes the percent variations of price rigidities around means rigidities in these stores. All the corresponding results for sales prices are in the parentheses.

The results demonstrate that the average price rigidities in regular prices are highly varied across stores. Super C has an average price rigidity of 14.99 weeks with no price changes, which is very close to the aggregate average price rigidity across these stores (14.20 weeks). Provigo has the highest price rigidity of 17.36 week without price changes. Loblaws has an average rigidity of only 10.24 weeks, which is much lower than both Super C and Provigo. This is an evidence of variation of price rigidity across firms, which indicates the price rigidity varies across these typical store types. We also note that percentage variations of mean rigidities of these stores are also small, respectively, 7.5%, 9.8% and 8.1% for Super C, Loblaws, and Provigo.

For sales prices, price rigidities in these stores are slightly varied in comparison to regular prices. Super C has an average price rigidity of 9.11 weeks with no price changes. Provigo has lowest price rigidity of 7.9 weeks. Loblaws has an average price rigidity of 10.07 weeks without price changes, which is the highest in the sale price. Percentage variations of price rigidities in these stores are still not large. Respectively, 9.5%, 10.0% and 12.9%

for Super C, Loblaws, and Provigo.

Compared with price rigidities in regular prices, price rigidities in sale prices are not varied so highly as in regular prices in these stores. In contrast, they are quite close to each other (around 9 weeks with no price changes). A reasonable explanation is that, because of the intense competition in this sector, grocery retailers have to change their transaction prices that the consumers pay almost as frequently as their competitors do in order to achieve competitive advantages. This is another evidence of dynamic price adjustment behavior.

Table 4 Price Rigidities in Stores

Store	**No. of SKUs**	**Price Rigidity**	**Std. Error**	**Percent Variation**
Super C	89	14.99 (9.11)	1.12 (0.87)	7.5% (9.5%)
Loblaws	89	10.24 (10.07)	1.01 (1.01)	9.8% (10.0%)
Provigo	89	17.36 (7.90)	1.40 (1.02)	8.1% (12.9%)

Another interesting finding is the negative correlation between price rigidities of regular and sales prices in these stores. See table 5, the second column includes the price rigidities of regular prices in these stores. The third column contains the price rigidities of sales prices in these stores. The fourth column shows the ranking of rigidities of regular prices in these stores and the fifth column showing the ranking of rigidities of sales prices in these stores. Loblaws has the lowest price rigidity in regular prices while it has the highest price

rigidity in sales prices. Provigo has the highest price rigidity in regular prices while the lowest price rigidity in sales prices. Super C has medium price rigidities in both regular and sales prices. Exactly, price rigidities between regular and sales prices are negatively related in these stores, which indicates that the more (less) rigid the regular price the less (more) rigid the sales price would be. This is quite an obvious evidence of dynamic price adjustment by applying promotions as an instrument of managing flexible price changes at the firm level. It implies that if grocery retailers don't change their regular prices frequently they have to change their transaction prices frequently instead. On the contrary, if they change their regular prices frequently they will change their transaction prices relatively infrequently. As a result, retailers eventually change their prices almost as frequently as their competitors so as to achieve competitive advantages.

Table 5 Correlation of Price Rigidities between Regular and Sales Prices in Stores

Store	**PR of Regular Prices**	**PR of Sales Prices**	**Ranking for Regular Prices**	**Ranking for Sale Prices**
Loblaws	10.24	10.07	3 (lowest)	1 (highest)
Super C	14.99	9.11	2 (medium)	2 (medium)
Provigo	17.36	7.90	1 (highest)	3 (lowest)

If we look further into the strategy types of these stores, we find that the negative correlation between price rigidities of regular and sales prices in these stores is definitely consistent with the store pricing strategy types. Loblaws is an Everyday Low Price store

(EDLP). Under the EDLP strategy the retailer's prices are low for an extended period of time, and therefore it will offer fewer promotional sales or discounts (Levy et al., 1997). As a result, Loblaws has the lowest price rigidity in regular prices but the highest price rigidity in sales prices. Provigo is a Hi-Lo store. Under the Hi-Lo pricing strategy, in contrast, the retailer's prices are generally higher, and the retailer tends to offer more frequent discounts through sales and promotions (Levy et al., 1997). Therefore, Provigo has the highest price rigidity in regular prices but the lowest price rigidity in sales prices. Super C is a discount store. Under this strategy, the retailer would like to offer promotions by minimizing its operation and management costs. Therefore, it is expected that the retailer would be more sensitive to menu costs/ costs of price changes compared to non-discount stores. Consequently, Super C would not like to apply as frequent price changes as Loblaws do in the regular price and Provigo in the sales price, and eventually its prices demonstrate medium rigidities.

If we look at the promotions introduced in these stores (see Table 6), it is clearly supported that different price strategy stores use promotions as the instrument of dynamic price adjustment differently in achieving competitive advantages. As an EDLP store, Loblaws introduced the fewest promotions (only 3.4%). As a Hi-Lo store, Provigo introduced the most promotions accounted for 72.4%. However, the discount store, Super C, introduced the average promotions (52.6%), which is quite close to the aggregate average percentage of promotions applied across these stores (48.7% see Table 3). These results implies that different pricing strategy types of stores apply different promotion strategies in their dynamic pricing adjustments, which support the view that firm level factor (e.g. pricing

strategy types) could be an important source of variation of price rigidity.

Table 6 Promotions in Stores

Store	**Price Decreases in Transaction Prices**	**Promotions**	**Promotion Percentage**
Loblaws	320	11	3.4%
Super C	321	169	52.6%
Provigo	557	403	72.4%

5.3 Price Rigidities of Product Categories

This part presents variation of price rigidities across product categories. According to the existing literature (Carlton, 1986; Wynne, 1995; and Bils et al., 2003), price rigidity has been argued to be related to product categories. Carlton (1986) revealed that "The degree of price inflexibility varies enormously across products". Wynne (1995) found that a lot of products change prices relatively infrequently while a lot of other products change prices frequently. Bils et al. (2003) also alleged that "the frequency of price changes varies dramatically across goods". For this purpose, I will examine both regular and sales prices to check if such variation exists and how it will demonstrate in this particular sector.

Look at table 7, the first column represents the 11 product categories across theses stores. The second column contains the average price rigidities of product categories in regular and sales prices across these stores (price rigidities of sales prices in the parentheses). The third column represents the corresponding rankings of price rigidities of product categories for both prices (rankings for the sales prices in the parentheses). The fourth column shows the comparison of the rankings for regular and sales prices. For a certain product category, if the rankings of rigidities in both prices are the same, "same" will be marked correspondingly in the fourth column. If the rankings are close (with difference of only 1), "close" will be marked. Other comparisons are also appropriately marked.

In regular prices, the price rigidities of product categories vary highly from 10.49 to 26.72 weeks. Some categories like Baby Products & Foods and Tissues & Pet Supplies are very rigid (more than 23 weeks); Beverage, Frozen Foods, and Soup/Canned Foods have about 11 weeks without price changes; others have price rigidities around 13 weeks with no price changes.

In sales prices, price rigidities vary highly from 5.34 weeks to 21.47 weeks. Baby Products & Foods have 21.47 weeks without price changes. Beverage, Breakfast/Cereals, and Soup/Canned Foods have about 6 weeks with no price changes. Tissues& Pet Supplies have about 16 weeks without price changes. Others have price rigidities around 8 weeks. Compared with price rigidities of product categories in regular prices, rigidities of product categories in sales prices demonstrate a bit higher variation (variation percentage 16% Vs 11%).

When we examine the rankings of price rigidities of product categories in regular and sales prices, we found that almost half product categories (5 categories) have same or close rankings of price rigidities in both prices while another half (5 categories) have quite different rankings in regular and sales prices. For example, Baby Products& Foods, and Tissues& Pet Supplies are all very rigid in both prices. Beverage, and Soup/Canned Foods are all less rigid in both prices. Price rigidities of these product categories seem not following the compensatory logic between rigidities of regular and sales prices as discussed above. On the contrary, Breakfast/Cereals, and Condiments& Sauces are highly rigid in regular price but less rigid in sales price. Dairy Products, Health& Beauty Aid, and Frozen Foods are less rigid in regular price but highly rigid in sale price. This half of product categories support the compensation principle of price rigidities between regular and sales prices. This obvious discrimination between product groups indicates that grocery retailers may apply quite different price strategies across product categories, and thus reinforces the hypothesis that product category is another important source of variation of price rigidity.

Table 7 Price Rigidities of Product Categories

Product Category	**Price Rigidity**	**Ranking of Price rigidity**	**Ranking Comparison**
1. Beverage	10.49 (5.7)	11 (10)	Close
2. Juices	12.65 (7.24)	6 (7)	Close
3. Breakfast / Cereals	12.66 (5.34)	5 (11)	Quite different
4. Dairy Products	12.47 (9.14)	7 (3)	Quite different
5. Condiments & Sauces	12.91 (7.01)	4 (8)	Quite different
6. Baby Products & Foods	26.72 (21.47)	1 (1)	Same
7. Health & Beauty Aid	11.17 (8.78)	8 (4)	Quite different
8. Frozen Foods	10.85 (8.13)	10 (6)	Quite different
9. Tissues & Pet Supplies	23.22 (15.69)	2 (2)	Same
10. Soup / Canned Foods	10.92 (6.11)	9 (9)	Same
11. Households	15.12 (8.71)	3 (5)	Near

5.4 Price Rigidities of Product Categories in Stores

This section examines if price rigidities vary across product categories in stores. Look at table 8, the second column represents the price rigidities of 11 product categories for regular and sale prices in Super C. The third column shows the price rigidities of 11

product categories for regular and sale prices in Loblaws. The fourth column contains the price rigidities of 11 product categories for regular and sale prices in Provigo. Numbers in the parentheses are the results for sales prices.

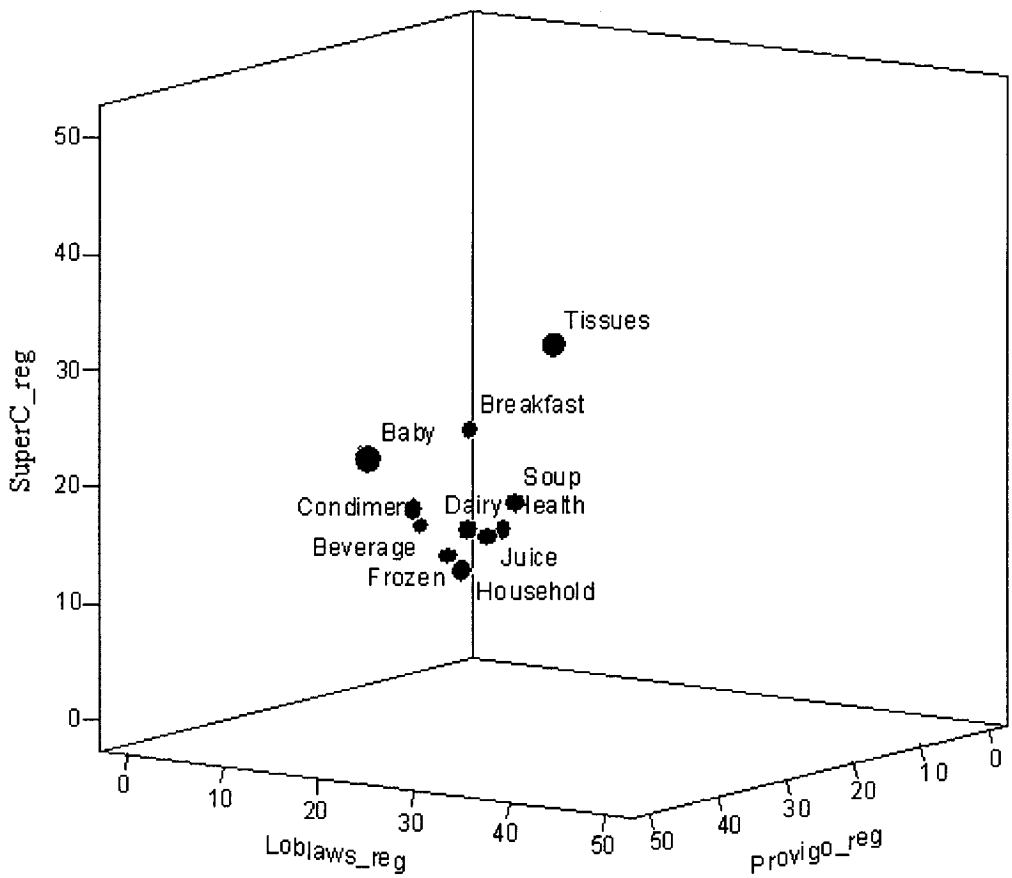
In a rough view, price rigidities across product categories are also highly varied in stores. For regular prices, in Super C, price rigidities vary highly from 9.81 weeks to 29.71 weeks across the 11 product categories. At EDLP store, Loblaws, price rigidities also vary highly from 4.23 weeks to 20.92 weeks. At the Hi-Lo store, Provigo, price rigidities vary greatly from 9.13 weeks to 40.71 weeks across categories. Similarly, for sales prices, In Super C, price rigidities vary from 5.41 weeks to 21.63 weeks across product categories. In Loblaws, price rigidities vary from 4.23 to 20.92 weeks. In Provigo, price rigidities vary highly from 3.08 weeks to 26.01 weeks across product categories.

Table 8 Price Rigidities of Product Categories in Stores

Category	Super C	Loblaws	Provigo
1. Beverage	12.01 (7.49)	4.23 (4.23)	15.23 (5.37)
2. Juices	11.84 (5.87)	11.14 (11.05)	14.97 (4.81)
3. Breakfast / Cereals	19.99 (5.64)	6.70 (6.63)	11.30 (3.74)
4. Dairy Products	12.24 (8.13)	9.61 (9.54)	15.55 (9.77)
5. Condiments & Sauces	14.17 (7.48)	5.98 (5.98)	18.59 (7.58)
6. Baby Products & Foods	22.68 (21.63)	16.76 (16.76)	40.73 (26.01)
7. Health & Beauty Aid	11.80 (9.17)	10.35 (9.05)	11.37 (8.11)
8. Frozen Foods	9.81 (7.20)	7.36 (7.30)	15.37 9.88)
9. Tissues & Pet Supplies	29.71 (17.85)	20.92 (20.92)	19.01 (8.29)
10. Soup / Canned Foods	13.77 (5.41)	9.85 (9.85)	9.13 (3.08)
11. Households	10.16 7.95)	13.25 (13.25)	21.96 (4.93)

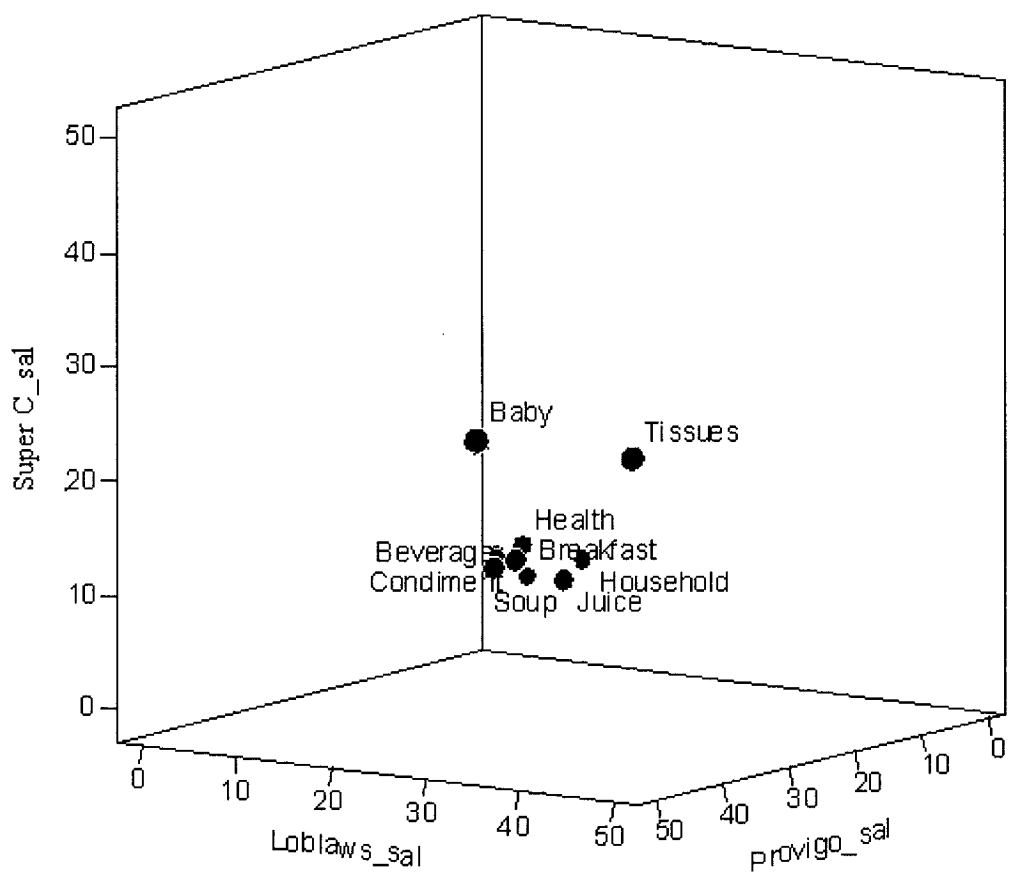
To understand the results better and try to obtain a relatively complete insight in the relations within price rigidities of categories in these stores, I present a series of five graphs to visually demonstrate the variation of category rigidities in these stores. The first two (3-D) graphs plot the rigidities of each category in these stores, first for the regular price and the second graph for the sales price. The next three (2-D) graphs plot category rigidities for both prices in each store individually.

Graph 1 Price Rigidities of Categories in Stores for Regular Price(weeks)



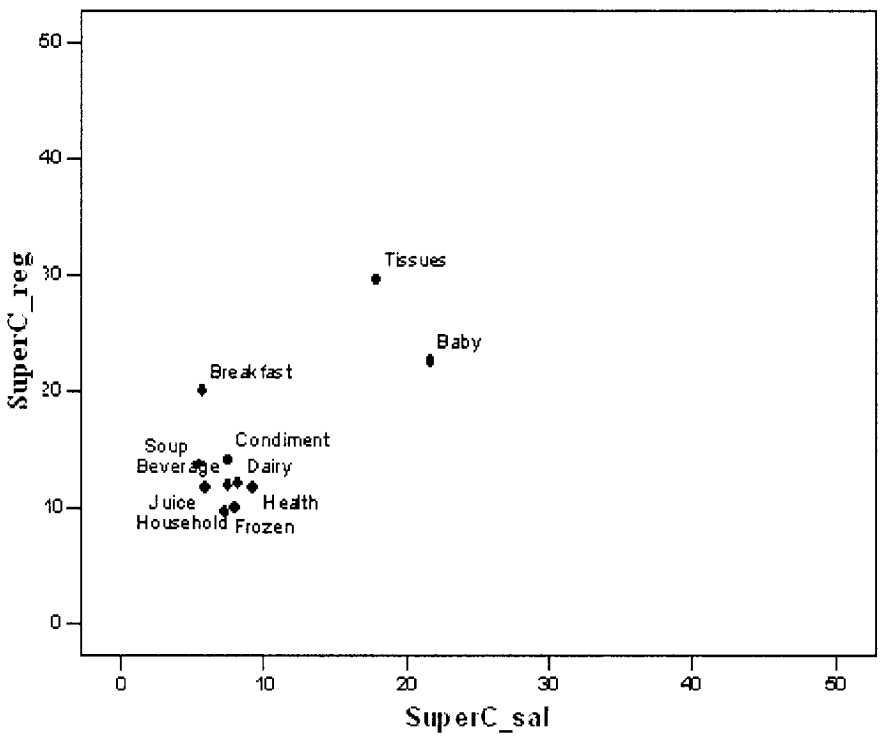
For the regular price, quite obviously, price rigidities are highly varied across categories across these stores (points scattered strongly). Some categories, for example, Tissues, Breakfast, and Baby Products are obvious outliers which imply these product categories have relatively high rigidities in these stores. Others seems relatively closer compared with the three outliers, however, they are still scattered. And Household and Frozen categories are relatively less rigid in comparison with other categories.

Graph 2 Price Rigidities of Categories in Stores for Sales Price (weeks)



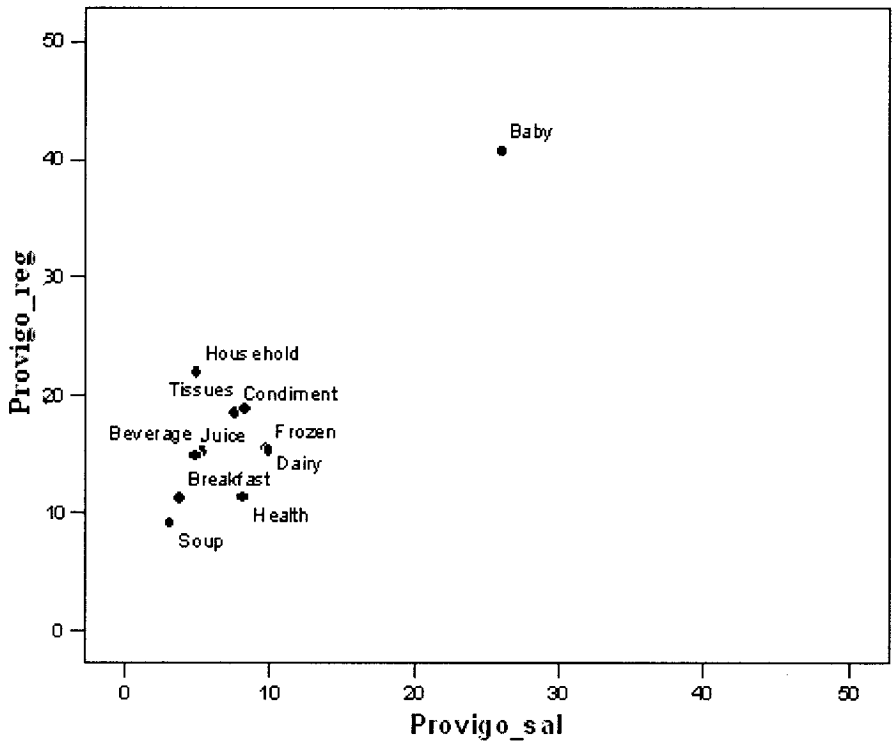
For the sales price, price rigidities are also varied across product categories across these stores. Tissues and baby products are still obvious outliers that indicate they are still very rigid in sales prices. Others seem relatively clustered. Relatively, category rigidities in sales prices are not varied as highly as in regular prices probably because transaction prices face direct and stronger competitions.

Graph 3 Super C: Regular and Sale Price Rigidity (weeks)



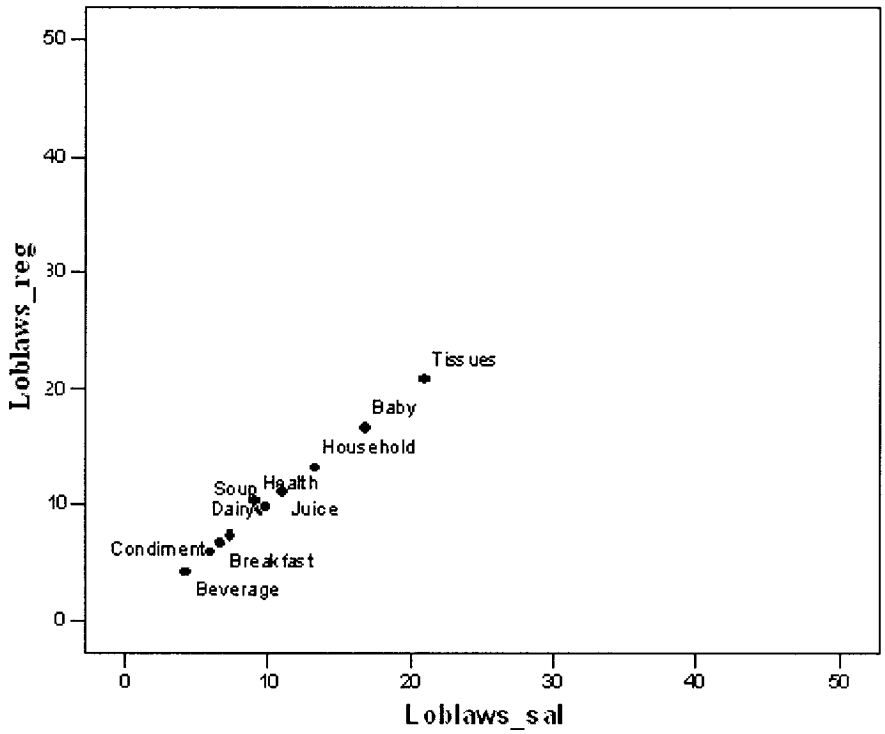
Look at the category rigidities for both regular and sales prices in Super C, price rigidities are highly varied across categories in both prices. Tissues, Breakfast, and Baby products are obviously much more rigid than others in both regular and sales prices. And definitely the regular prices are more rigid than the sales prices such that the points are all above the diagonal line in the graph.

Graph 4 Provigo: Regular and Sale Price Rigidity (weeks)



In Provigo, the category rigidities are also highly varied. Baby products are far more rigid than other categories while others are also scattered. Compared with in Super C, we note, in Provigo, category rigidities of regular prices are much more rigid than those of sales prices because the points are all much far above the diagonal line, which is exactly consistent with the pricing strategy of this Hi-Lo store that it applies a lot of promotions in its transaction prices.

Graph 5 Loblaws: Regular and Sale Price Rigidity (weeks)



In Loblaws, the category rigidities are also highly varied in both regular and sales prices. Tissues, Baby products, and Household categories are relatively more rigid in both prices than others. Beverage is relatively less rigid in both prices. An interesting finding is that all the points are visually almost in a straight line, and this line is very close to the diagonal line. This result implies that category rigidities for regular and sales prices are close to each other, which is also exactly consistent with the primary pricing strategy of Loblaws (an EDLP store) that seldom uses temporary promotions.

Based on the five graphs examining category rigidities in these stores visually, the results demonstrate more clearly that price rigidities are highly varied across categories, and that

patterns of variation of category rigidities are also highly varied across stores, which is exactly consistent with the pricing strategy types of these stores. Therefore, at the category in store level, the results also support the view that price rigidities are highly varied across categories and store types. In one word, these results convince us to believe that both store level factor and product category are important sources of variation of price rigidity.

5.5 Asymmetry in Price Rigidity

This section examines whether there is asymmetry in price rigidity in the grocery retail sector. Asymmetry in price rigidity is actually another kind of variation of price rigidity between positive and negative price changes. Look at table 9, Asymmetry in Price Rigidity at Aggregate, Store and Category Level. The second column stands for frequencies of positive price changes and the third column stands for frequencies of negative price changes. The fourth column contains the values of t- tests. All the corresponding results for sales prices are included in the parentheses. At the aggregate level, the aggregate average frequency of positive price changes (across these stores) is 2.44 times in the 52 weeks and the aggregate average frequency of negative price changes is 2.30 times. The t-test shows that there is no significant asymmetry (p=0.22). Check asymmetry at the store level, in Super C, the average frequency of positive price changes is 1.99 times, and the average frequency of negative price changes is 1.71 times. The t-test shows that there is no significant asymmetry or only marginal asymmetry (p=0.08). In Loblaws, the average frequency of positive price changes is 3.55 times, and the average negative price change is

3.47 times. The t-test shows that there is no significant asymmetry (p=0.42). In Provigo, the average positive price change is 1.78 times, and the average negative change is 1.73 times. The t-test also shows that there is no significant asymmetry (p=0.42). If we look at the results for sales prices, the findings are almost the same. Therefore, there is generally no significant asymmetry in the price rigidity in the grocery retail sector. Yet, note the absolute values of positive change frequencies are always higher than absolute values of the negative change frequencies.

If look at asymmetry at the category level (across stores), only Dairy Products show significant asymmetry in regular prices (p=0.03) and Health & Beauty Aid demonstrate significant reversed asymmetry in both sales price (p=0.03) and regular price (p= 0.00). For most of the product categories, there is no significant asymmetry in regular or sales prices. Yet, note that in absolute terms, asymmetry is shown by 7 out of 11 categories in both regular and sales prices.

Table 9 Asymmetry in Price Rigidity at Aggregate, Store and Category Level

Level	**Frequency of Positive Changes**	**Frequency of Negative Changes**	**t-test (p value)**
Aggregate	2.44 (4.52)	2.30 (4.49)	0.22 (0.45)
Super C	1.99 (3.74)	1.71 (3.61)	0.08 (0.34)
Loblaws	3.55 (3.66)	3.47 (3.60)	0.42 (0.43)
Provigo	1.78 (6.17)	1.73 (6.26)	0.42 (-0.44)
1. Beverage	4.04 (6.96)	3.71 (6.83)	0.35 (0.46)
2. Juices	2.67 (6.22)	2.33 (5.89)	0.33 (0.40)
3. Breakfast / Cereals	2.76 (5.30)	2.30 (5.21)	0.13 (0.43)
4. Dairy Products	2.54 (4.13)	1.71 (3.54)	0.03 (0.24)
5. Condiments & Sauces	2.73 (5.40)	2.90 (5.57)	-0.40 (-0.43)
6. Baby Products & Foods	1.33 (2.11)	1.44 (2.22)	-0.42 (-0.44)
7. Health & Beauty Aid	1.80 (2.87)	2.67 (3.77)	-0.00 (-0.03)
8. Frozen Foods	2.86 (4.90)	2.33 (4.38)	0.16 (0.32)
9. Tissues & Pet Supplies	1.00 (2.52)	1.19 (2.81)	-0.26 (-0.36)
10. Soup / Canned Foods	2.75 (5.58)	2.75 (5.50)	0.50 (0.48)
11. Households	2.22 (4.06)	1.86 (3.72)	0.15 (0.27)

Look at asymmetry in price rigidity of product category in stores (see table 10-12), in Super C, none of product categories demonstrate significant asymmetry in either regular or

sales price. Nonetheless, 8 out of 11 categories show asymmetry in both regular and sales prices. In Loblaws, similarly, no product categories show significant asymmetry in both regular and sales prices. Contrarily, Health & Beauty Aid demonstrates significant reversed asymmetry in both regular and sales prices ($p=0.01$, and 0.02 respectively). However, 9 out of 11 product categories show asymmetry in both prices. In Provigo, only Frozen Foods show significant asymmetry in their regular prices ($p=0.03$) and Dairy Products demonstrate marginal asymmetry in their regular prices ($p=0.06$). Health & Beauty Aid show significant reversed asymmetry in the regular price ($p=0.03$). Others don't show significant asymmetry in both prices.

In general, I do not find a prevalence of statistically significant asymmetry in the grocery retail sector even if it appears that instances of positive changes are usually higher than those of negative changes. At the product category level, a few may demonstrate significant asymmetry in either regular or sales price. At the meantime, a few others may demonstrate significantly reversed asymmetry in regular or sales price.

Table 10 Asymmetry in Price Rigidity of Category in Super C

Super C	**Frequency of Positive Changes**	**Frequency of Negative Changes**	**t-test (p value)**
1. Beverage	2.71 (4.5)	2 (4.13)	0.29 (0.39)
2. Juices	2.00 (5.00)	1.66 (4.67)	0.22 (0.39)
3. Breakfast / Cereals	1.82 (4.73)	1.18 (4.64)	0.12 (0.45)
4. Dairy Products	2.37 (4.13)	1.62 (3.88)	0.12 (0.42)
5. Condiments & Sauces	1.44 (3.78)	1.66 (4.00)	-0.32 (-0.43)
6. Baby Products & Foods	1.5 (2.17)	1.66 (2.33)	-0.45 (-0.46)
7. Health & Beauty Aid	2.00 (2.90)	1.8 (2.80)	0.29 (0.44)
8. Frozen Foods	2.62 (4.63)	2.00 (3.75)	0.17 (0.27)
9. Tissues & Pet Supplies	0.42 (1.57)	0.71 (2.00)	-0.16 (-0.27)
10. Soup / Canned Foods	2.00 (4.50)	1.75 (4.25)	0.39 (0.36)
11. Households	2.66 (3.58)	2.16 (3.17)	0.17 (0.25)

Table 11 Asymmetry in Price Rigidity of Category in Loblaws

Loblaws	**Frequency of Positive Changes**	**Frequency of Negative Changes**	**t-test (p value)**
1. Beverage	6. 63 (6. 63)	6. 5 (6. 5)	0.47 (0.47)
2. Juices	4. 17 (4. 30)	3. 83 (4. 00)	0.43 (0.44)
3. Breakfast / Cereals	4. 18 (4. 27)	3. 72 (3. 81)	0.25 (0.27)
4. Dairy Products	3. 37 (3. 50)	2. 62 (2. 75)	0.22 (0.24)
5. Condiments & Sauces	5. 33 (5. 30)	5. 66 (5. 67)	-0.40 (-0.41)
6. Baby Products & Foods	2. 16 (2. 16)	2. 16 (2. 16)	0.50 (0.50)
7. Health & Beauty Aid	1. 7 (2. 30)	3. 4 (4. 1)	-0.01 (-0.02)
8. Frozen Foods	3. 75 (3. 88)	3. 25 (3. 38)	0.31 (0.33)
9. Tissues & Pet Supplies	1. 14 (1. 14)	1. 14 (1. 14)	0.50 (0.50)
10. Soup / Canned Foods	3. 25 (3. 25)	3. 25 (3. 25)	0.50 (0.50)
11. Households	3. 00 (3. 00)	2. 25 (3. 25)	0.15 (0.15)

Table 12 Asymmetry in Price Rigidity of Category in Provigo

Provigo	**Frequency of Positive Changes**	**Frequency of Negative Changes**	**t-test (p value)**
1. Beverage	2.75 (9.75)	2.50 (9.88)	0.39 (-0.48)
2. Juices	1.83 (9.33)	1.50 (9.00)	0.34 (0.45)
3. Breakfast / Cereals	2.27 (6.91)	2.00 (7.18)	0.27 (-0.37)
4. Dairy Products	1.88 (4.75)	0.88 (4.00)	0.06 (0.35)
5. Condiments & Sauces	1.78 (8.33)	2.00 (8.55)	-0.40 (-0.45)
6. Baby Products & Foods	0.33 (2.00)	0.50 (2.16)	-0.37 (-0.46)
7. Health & Beauty Aid	1.70 (3.40)	2.80 (4.40)	-0.03 (-0.15)
8. Frozen Foods	2.13 (5.63)	1.00 (4.75)	0.03 (0.37)
9. Tissues & Pet Supplies	1. 42 (4. 85)	1. 71 (5. 28)	-0.33 (-0.41)
10. Soup / Canned Foods	3. 00 (9. 00)	3. 25 (9. 00)	-0.43 (0.50)
11. Households	1. 00 (5. 58)	1. 16 (5. 75)	-0.30 (-0.43)

5.6 Price Rigidity for Private Brands

This section focally investigates price rigidity and asymmetry for private brands, and compares their results with national brands to examine whether private brands demonstrate

critical differences in price rigidity. Theoretically, private brands (or store brands) are really a store's "own" brands, for which a store may make extra effort to build and promote. Their strategies of product, price, and promotion may be quite different from those of national brands. Although private brands are becoming of greater interest to retailers, the number of products or SKUs of private brands is actually still small compared with national brands. In this study, I was able to collect continuous data for 8 categories (total 21 SKUs) of store brands in Super C, 6 categories (total 11 SKUs) in Loblaws, and 6 categories (total 12 SKUs) in Provigo. For some categories, there are only one or two SKUs with continuous data in the 52 weeks. In view of incomplete categories and lack of adequate SKUs in some categories, I will examine price rigidity and asymmetry in price rigidity for private brands only at aggregate level (across stores), store level and category across store level.

Look at table 13, the second column contains price rigidities for national brands, and the third column contains rigidities for private brands (results for sales prices are included in the parentheses). The fourth column is the comparison of price rigidities between national and private brands. For example, N.P represents that national brands are more rigid in regular price and private brands are more rigid in sales price.

In general, private brands are less rigid than national brands in regular prices, and more rigid than national brands in sales prices (at aggregate level). This may indicate that retailers would like to changes prices of private brands in a more regular and relatively permanent way (in regular prices) to attract more consumer patronage. On the other hand,

due to relatively less competition (lack of competitors and substitutes), grocery retailers would not like to change sales prices of private brands as frequently as for national brands. At the store level, in Super C and Provigo, both regular and sales prices for private brands are less rigid than for national brands. In contrast, in Loblaws both regular and sales prices for private brands are more rigid than for national brands. These results imply that for private brands there is also a variation of price rigidities across stores. While the EDLP store, Loblaws, is quite different from Hi-Lo and discount stores Super C and Provigo have more similarity in price rigidity, which is consistent with the previous results for national brands.

At the category level, of the 9 categories available for both private and national brands, private brands are more rigid than national brands in 4 categories in both regular and sales prices, and less rigid than national brands in another 4 categories in both regular and sales prices. The interesting finding is that in such comparison rigidities of regular and sales prices for private brands in most cases change in the same direction, that is to say, if the regular price for private brands is more (less) rigid than for national brands, then the sales price for private brands is also more (less) rigid than for national price. This phenomenon seems against the "compensatory" observation between regular and sale prices as mentioned previously. This result implies that the private brands may not compete strongly with national brands and the pricing style for private brands may follow some specific nature inherent in the private brands themselves.

Table 13 Price Rigidity for Private Brands at Aggregate, Store, and Category Level

Level	National Brand	Private Brand	Price Rigidity Comparison
Aggregate	14.20 (9.03)	12.54 (9.39)	N.P
Super C	14.99 (9.11)	11.47 (8.40)	N.N
Loblaws	10.24 (10.07)	14.75 (14.68)	P.P
Provigo	17.36 (7.90)	12.40 (6.25)	N.N
1. Beverage	10.49 (5.70)	8.57 (6.47)	N.P
2. Juices	12.65 (7.24)	16.12 (13.28)	P.P
3. Breakfast / Cereals	12.66 (5.34)	13.43 (8.79)	P.P
4. Dairy Products	12.47 (9.14)	8.49 (6.40)	N.N
5. Condiments & Sauces	12.91 (7.01)	8.67 (6.94)	N.N
8. Frozen Foods	10.85 (8.130	8.91 (8.09)	N.N
9. Tissues & Pet Supplies	23.22 (15.69)	15.17 (9.53)	N.N
10. Soup / Canned Foods	10.92 (6.11)	14.03 (10.18)	P.P
11. Households	15.12 (8.710	18.59 (13.51)	P.P

For asymmetry in price rigidity for private brands, look at table 14 Asymmetry in Price Rigidity for Private Brands at Aggregate, Store, and Category Level. The first column stands for the levels. The second column contains frequencies of positive price changes for private brands, and the third column contains frequencies of negative price changes for private brands. The fourth column includes the p values of t-test.

At aggregate level, the regular price of private brands shows marginal asymmetry (p=0.09) and the sales price doesn't demonstrate significant asymmetry (p=0.23), even if there is asymmetry at the absolute level. At the store level, these three stores all don't show significant statistical asymmetry in both regular and sales prices, while showing asymmetry in the absolute values.

At the category level, Dairy Products demonstrate marginal asymmetry in both regular and sales prices (p=0.06 and p=0.05). Condiments & Sauces show marginal asymmetry in regular prices (p=0.09), and Soup / Canned Foods also show marginal asymmetry in regular price (p=0.09). Similar to national brands, private brands in general do not demonstrate statistically significant asymmetry, even if the absolute values do.

Table 14 Asymmetry in Price Rigidity for Private Brands at Aggregate, Store, and Category Level

Level	Frequency of Positive Changes	Frequency of Negative Changes	t-test (p value)
Aggregate	2.91 (4.23)	2.30 (3.75)	0.09 (0.23)
Super C	2.71 (3.86)	2.14 (3.42)	0.18 (0.32)
Loblaws	4.18 (4.27)	3.00 (3.09)	0.17 (0.18)
Provigo	2.08 (4.83)	1.92 (4.91)	0.39 (0.47)
1. Beverage	3.57 (5.86)	3.57 (6.57)	0.50 (-0.40)
2. Juices	2.66 (4.83)	2.50 (4.67)	0.45 (0.47)
3. Breakfast / Cereals	1.25 (2.25)	1.75 (2.75)	-0.10 (-0.10)
4. Dairy Products	5.00 (5.63)	2.75 (3.50)	0.06 (0.05)
5. Condiments & Sauces	3.50 (4.25)	2.00 (3.00)	0.09 (0.17)
8. Frozen Foods	3.00 (3.50)	2.00 (2.50)	0.21 (0.30)
9. Tissues & Pet Supplies	1.50 (2.50)	1.00 (2.00)	0.35 (0.35)
10. Soup / Canned Foods	2.66 (3.67)	0.66 (1.67)	0.09 (0.13)
11. Households	1.37 (2.75)	2.00 (3.25)	-0.21 (-0.32)

Chapter 6 Discussions

6.1 Discussion of Main Findings

In this study, I specifically investigated price rigidity in the grocery retail sector, which has not often been the subject of a comprehensive study earlier. As marketing researchers or consumers, we may receive grocery flyers weekly, the prices in this sector are actually much more rigid than we can imagine. As a whole, products in the grocery retail sector remain their prices unchanged for more than 3 and half months (14.20 weeks). If we take the temporary price changes (sales or promotions) into account, the prices still remain unchanged for more than 2 months (9.09 weeks) on average. Slade (1998) investigated 3 brands in ten supermarkets (total 30 SKUs) in a small U.S town. Her study discovered 5 week average rigidity in this sector. Our study conducted in a Montreal area found that the prices in grocery retail sector could be much more rigid. Our results are based on a larger sample (267 SKUs) compared with Slade's (30 SKUs). Therefore, our results should be more representative and reliable.

Although grocery retailers would not like to change their regular prices frequently due to the costs of changing prices or trying to keep higher reference prices, they usually or have to apply temporary promotions frequently in their transaction prices as a complementary instrument to make dynamic responses to intense changes in business environment, e.g., increased competitions, shifting consumer tastes, or even changes in social or economic

conditions. This dynamic price adjustment is a compensatory approach of price inflexibility in the regular price. By this approach, the grocery retailers need not to change their regular prices frequently, which may help lower costs of changing prices and keep higher reference prices. From the consumer side, higher reference prices and frequent promotions in the transaction prices could lead to higher consumer satisfaction and patronage. It is reasonable to argue that this dynamic pricing behavior may both maximize firm benefits and increase consumer satisfaction and loyalty.

In this study, there are persuasive evidences that firm level factors are important sources of variation of price rigidity. We examined three typical pricing strategy types, i.e. EDLP, Hi-Lo, and discount stores. The price rigidities across these stores are highly varied. The Hi-Lo store (i.e. Provigo) demonstrates the highest price rigidity in regular prices and the lowest price rigidity in sales prices. The EDLP store (i.e. Loblaws) shows the lowest price rigidity in regular prices and the highest price rigidity in sales prices. The discount store (i.e. Super C) has medium price rigidities in both regular and sales prices. Interestingly, there is an exact negative correlation between price rigidities of regular and sales prices in these stores. Such relationship is definitely consistent with the specific pricing strategies of these stores. This result indicates that the firm level factor, e.g. the pricing strategy types, could be one of the main sources of variation of price rigidity.

Product category is another important variable in explaining variation of price rigidity. At both aggregate and store level, price rigidities are highly varied across product categories. Some categories (e.g. Baby Products& Foods, and Pet Supplies) are highly rigid in both

regular and sales prices in all these stores, which is probably because these categories face relatively less competition in the market. Some categories (e.g. Beverage, Juices, and Soup/canned Foods) are less rigid in both prices in these stores, which is probably because these categories face relatively high competitions in the market. Some product categories (i.e. Breakfast / Cereals, Dairy Products, Condiments & Sauces, Health & Beauty Aid, and Frozen Foods) demonstrate highly "compensated" price rigidities in regular and sales prices; others (i.e. Baby Products & Foods, and Pet Supplies, Beverage, Juices, and Soup/canned Foods) show very "similar" price rigidities in regular and sales prices. These patterns indicate that grocery retailers may employ very different price strategies on different product categories according to the special nature of the product category itself. And this leads to believe that product category could be another important source of variation of price rigidity.

I do not find statistically significant asymmetry in price rigidity in our dataset. At the store and product category level, although there are a few cases demonstrating marginal or significant asymmetries, there is no systematic statistically significant asymmetry at any level we examined. This result is consistent with the similar study's (Slade, 1998) finding that the frequency of "price increases and decreases are roughly equal in the grocery retail sector". However, the possibility of asymmetry is never too far away given that in a large number of cases, positive price changes outnumber negative price changes. It is difficult to make much out of this tension in the observations because of the relatively still small sample of observations instances (52 weeks). According to many previous researchers (Ball and Mankiw, 1994; Borenstein and Shepard, 1996; Peltzman, 2000), generally there

is pervasive asymmetry in retail prices. However, most of those studies looked at much longer time series observations, although at an aggregate level, the price dynamics captured in those larger horizon studies may be absent in our study, leading to the lack of significance.

It is also possible that the lack of significant asymmetry in this study could be attributed to the special nature of this grocery retail sector, e.g. the intense competition. While there is some disagreement on the issue, some researchers have suggested that asymmetry cannot be sustained in competitive markets. For example, Galeotti et al. (2003) writes, "asymmetry is in general possible because of the non-competitive market". We can speculate that competition may be driving the general lack of asymmetry. In the setting where we collected the data, grocery retail sector, there are clustered competitors and enormous substitutes in a product category. The competition is extraordinarily fierce. In order to retain consumers and achieve competitive advantages, these grocery retailers have to decrease their prices frequently, or at least, as frequently as their rivals do. Sometimes, retailers have to decrease their prices frequently in a significant way such that some categories demonstrated significantly reversed asymmetry.

Compared with national brands, private brands are in general less rigid in the regular price (12.54 vs. 14.20), and a bit more rigid in the sales price (9.39 vs.9.03). This result may indicate that private brands face relatively less market competition (e.g., lack of competitors and substitutes) than national brands, such that that retailers would like to changes prices of private brands in a more regular and relatively permanent way (the

regular price) while change sales prices of private brands relatively less frequently than for national brands.

Another interesting finding is that, in such comparison at store and category level, rigidities of regular and sales prices for private brands in most cases change in the same direction, i.e., if the regular prices of private brands are more (less) rigid than those of national brands, then the sales prices of private brands is also more (less) rigid than those of national brands. This phenomenon implies that private brands may not compete strongly with national brands and thus the pricing style for private brands may follow some special nature inherent in the private brands themselves.

Summarily, there are some observable evidences that the pricing behavior for private brands may be fundamentally different from that for national brands. However, this still calls for further in-depth study.

6. 2 Academic and Managerial Implications

Academic Implications:

First, this study is among the first few comprehensive studies on price rigidity in the grocery retail sector. Although price rigidity has a long history of academic interest in economics and aroused high interests in the marketing field recently, there were no

researchers taking a serious and comprehensive investigation in this pricing pattern in this particular industry. In view of a lot of gaps and ambiguities sill remained in this issue, our study definitely enriches the marketing literature on this topic.

Second, the grocery retail sector is characterized with extraordinary market competition, and possibly frequent price changes (Levy et al., 1997). Our results showed that the price in this sector is much more rigid than we commonly imagine. Slade (1998) discovered a 5 - week average rigidity in this sector based on aggregate dataset and small sample of 3 brands in 10 supermarkets in a U.S small town. Our average rigidities in both regular and sales prices are much higher than her result for transaction price. Even if considering the sample sizes and data from different countries, this discrepancy is still startling. Undoubtedly, such inconsistency calls for more studies in this sector.

Third, this study investigated variation of price rigidity across stores, product categories, and brands by using highly disaggregate data at SKU and brand level, which has not been done in previous studies. If identifying sources of variation of price rigidity is important in uncovering the underlying theoretical bases of price rigidity (Gordon, 1981), our study could definitely have a meaningful implication to marketers.

Fourth, none of previous studies examined both regular and sales prices in the same study on the issue of price rigidity. Our study implied that examining different prices (e.g. regular or transaction price, actual or unit price) could have quite different results. This is possibly the reason why previous studies often demonstrated inconsistent results. The general focus

of the economic literature has been on transaction (sales) prices. This is understandable since that is the price that ultimately impact consumers' wallet. However, for marketers, psychological price points like reference prices are also important. Regular prices may play an important role in framing such reference prices in consumers' minds. Therefore, our investigation of the regular prices also captures the important decisions taken by retailers in managing such consumer issue.

Managerial Implications:

There are also several important implications for managers or practitioners in the grocery retail sector. First of all, although price inflexibility is often argued to be detrimental to competitiveness, our study reminds retailers that they may use promotions properly in the transaction prices as a complementary tool to make dynamic responses to intense changes in business environment. In this way, they need not to change their regular prices frequently, and this may maximize firms' benefit (e.g. lowering costs of changing prices; keeping higher reference prices) and consumer satisfaction (e.g. more discounts).

Second, grocery retailers need to keep in mind that different marketing designs could be employed according to the special characteristics of different product categories. Our study implies that price rigidity is highly varied across product categories. For example, for the durable categories, not-daily- use categories, it could be wise to apply relatively sticky prices or promote on the holidays when the consumer visits rise. For the daily necessities, it could be wise to keep frequent price changes to attract more consumer patronages.

Third, store positioning plays a significant role in dynamic pricing behaviour. This thesis indicated that different grocery store types may demonstrate very different dynamic pricing patterns. However, in such highly competitive industry, such differences are more subtle and non-obvious. In order to achieve competitive advantage, grocery retailers have to make balance between costs and price flexibility. Usually, they have to change their transaction prices as frequently as their rivals in responding to competition and consumer concerns. Therefore, store positioning should be based on multiple factors (e.g. store resources, degree of competition, consumer demographics, etc.).

Fourth, this study implies that the price adjustment patterns for private labels could be fundamentally different and this different is consistent across stores and product categories. Private brands could be a good option to avoid fierce market competition and frequent price changes. At the same level of qualities as national brands, private brands might achieve higher competitive advantage.

6.3 Limitations

This thesis is one of the first studies that take serious and extensive investigations into issues on the heatedly debated phenomenon of price rigidity. Similar to other studies, there are several characteristics that limit the generalizability of its findings and conclusions.

First, while we are considering dynamic price change activities, our number of

observations is limited to only 52 weekly observations. There are two issues that may arise due to this: if the store change prices significantly more frequently than once a week, we would have missed a number of important activities. Our fieldwork suggests that multiple changes within a week are not impossible although they do not happen often. Thus, it serves a cautionary note in the interpretation of our results. On another note, 52 weeks may not be a long enough time to capture all price dynamics. Other studies on price rigidity use many years' price data. So, while we stand behind some surprising results (e.g. lack of significant asymmetry) in our data, we realize that we may not have captured the full extent of the long run dynamics, however, this limitations must be considered in perspective of we gained- disaggregate prices, multiple stores, multiple categories, and an ability to look for variation at the store, brand, and category levels.

Second, we should be aware that the grocery retail sector is a highly varied industry in terms of the store scale, within –store product categories, pricing strategies, and etc. Only three stores in a Montreal area are far from enough to represent the whole industry. In different region and countries, the pricing behavior may demonstrate great difference due to the different consumer demographics, cultures, social and economic conditions. This is probably why Slade's (1998) result based on data from U.S. supermarkets highly differed from our result in Canadian grocery retail industry. This calls for more similar studies in different level of grocery stores, pricing strategy type stores, and geographical areas. In this way, we may obtain a relatively complete picture of this pricing pattern in the grocery retail sector.

Third, the three sample stores and product categories including SKUs in each category are not randomly selected in a statistical sense. Except for the consideration of competition as mentioned in the research methodology, these three stores were also chosen primarily under the consideration for convenience of data collection. In order to have same categories and SKUs across these stores, the selection of product categories and SKUs is quite arbitrary in one way or the other.

Fourth, number of SKUs in the product categories in this study is highly varied. Some category (e.g. Households) has as many as 15 SKUs while others (e.g. Soup / Canned Foods) has only as few as 5 SKUs with continued data available. Although this is unavoidable because the number of products is actually greatly varied across categories even in the same grocery store, undoubtedly, only few products in a category will weaken the generalizability of the result for the category.

Fifth, fresh foods, and vegetables were not taken into account in this study although they play an important part in the grocery retail store in terms of either satisfying consumer needs or earning revenues for the stores. In light of the special nature of fresh product categories (e.g. characteristics of freshness and perishability, high demand of storage conditions), their pricing strategies could be quite different from those of packaged categories.

6.4 Future Research

There are several directions recommended for future research in the context of marketing. First, this study is purely descriptive in its scope. It makes no attempt to comprehensively characterize the nature of rigidities across the different categories. A logic next stage of the research would be a study that would consider the inherent differences between the categories as possible explanations for rigidities. For example, factors like brand loyalty, shelf space allocation, degree of daily use, competition, shelf life, supplier relationships, etc. could be used as independent variables to explain patterns of rigidity.

Second, previous studies usually used frequency of price changes as the sole measure of price rigidity. Theoretically and practically, magnitude of price changes is another important consideration in price changes. If menu costs are an important explanation of price rigidity, the magnitude of price changes seems definitely related to the costs of changing prices and the frequency of price changes. Therefore, the measure of magnitude of price changes or a combination measure of magnitude and frequency of price changes could be explored in the future studies.

Third, the grocery retail industry is commonly marked with intense competition. Such competition is possibly a critical consideration in the pricing behavior. In this study, some evidences indicate that price rigidity and asymmetry in this sector might be highly related to competition at the product category and brand levels. However, this still remains for further investigation.

Fourth, private brands are becoming more and more interesting to grocery retailers. It seems that there are some special natures inherent in the private brands themselves that may lead to quite different pricing behavior for private brands. Although this study attempted to take an extensive investigation of price rigidity and asymmetry for the private brands, the generalizability and reliability of the results is still doubted due to the incomplete product categories and lack of adequate SKUs in categories examined in this study. Private brands could be much meaningful for future research in terms of uncovering some critical factors (e.g. competition, and firms' own pricing style) influencing pricing behavior.

Fifth, this study found that product category could be an important source of variation of price rigidity. Previous studies indicate that different product categories demonstrate different nature or characteristics in the context of consumption and marketing issues. Therefore, how these characteristics of a product category relate to price rigidity would contribute a lot to the marketing literature.

Finally, grocery retail sector is a large and highly varied industry. It is not wise to draw a conclusion only by examining a few stores in a particular area. Definitely, similar studies at different grocery retail levels, in different regions and countries are necessary for the future research to calibrate this debated pricing phenomenon.

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Appendix 1: Selected Product Categories and SKUs

1. Beverage	Private Brand	Manufacturer
Molson Dry Beer 24x341ml	NO	Molson Canada
Molson Dry Beer 12x341ml	NO	Molson Canada
HEK Beer 6x341ml	NO	Brasserie HEK
Bleue Dry 12x341ml	NO	Brasserie Labatt
Pepsi Diete 12x355ml	NO	Pepesi-Cola Canada Ltd.
Coco Cola Classic 2L	NO	Coca-Cola Canada Ltd.
Sprite 1L	NO	Coca-Cola Canada Ltd.
Perrier Lemon 750ml	NO	Nestle Waters Canada
Montclair 1L	NO	Nestle Waters Canada
Super C Natural Spring Water 1.5L	YES	Briska Inc.
Super C Mineral Water 1L	YES	Briska Inc.
Super C Cola 2L	YES	Briska Inc.
PC Natural Spring Water 1.5L	YES	Sunfresh Ltd
PC Cola 2L	YES	Loblaws Inc.
2. Jucies		
Tropicana Orange Juice 1.89L	NO	Tropicana Products Inc.
Welch's Fruit 1.82L	NO	Welch Foods Inc.
Ocean Spray Cochtail1.89L	NO	Ocean Spray Cranberries Inc.
Del Monte 1L	NO	Del Monte Corporation
Rougemont 1.89L	NO	A. Lassoonde Inc.
Oasis Classic 960ml	NO	A. Lassoonde Inc.
Super C Orange Juice 1.89L	YES	Briska Inc.
Super C Fruit Punch Drink 2L	YES	A. Lassoonde Inc.
PC Juice Coctail 1.89L	YES	Loblaws Inc.
PC White Grape Juice 1.82 L	YES	Sunfresh Ltd
3. Breakfast / Cereals		
Shreddies Cereal 620g	NO	Kraft Canada Inc.
ALPHA Bits 400g	NO	Kraft Canada Inc.
Sugar Crisp 400g	NO	Kraft Canada Inc.
Nesquick Cereal 775g	NO	General Mills Canada Corporation
Cheerios Apple 575g	NO	General Mills Canada Corporation
Cheerios Multi-Grain 450g	NO	General Mills Canada Corporation
Chex Honey Nut 430g	NO	General Mills Canada Corporation
Corn Flakes 750g	NO	Kellogg Canada Inc.
Pops Corn 375g	NO	Kellogg Canada Inc.
Special K Red berries 350g	NO	Kellogg Canada Inc.
Life 730g	NO	QTG Canada Inc.
Super C Corn Flakes 675g	YES	Briska Inc.
PC Corn Flakes 750g	YES	Sunfresh Ltd
PC Crispy Rice 525g	YES	Sunfresh Ltd

4. Dairy Products		
Quebon 3.25% Bottle Milk 2L	NO	Natrel Inc.
Lactantia 2% Skimmed Milk 2L	NO	Lactantia Ltd.
Natrel 1% Partly Skimmed Milk 2L	NO	Natrel Inc.
Soya 1.89L	NO	Parmalat Dairy & Bakery Inc.
Omega Egg 12un	NO	Burnbrae Farms Ltd.
Large Egg 12un	YES	Briska Inc.
Extra Large Egg 12un	YES	Briska Inc.
Lactantia Butter 454g	NO	Lactantia Ltd.
Saputo Cheese 700g	NO	Saputo Inc
P'tit Quebec Cheese 600g	NO	Kraft Canada Inc.
Super C Cheddar Cheese 600g	YES	Briska Inc.
Super C Butter 454g	YES	Briska Inc.
5. Condiments, Sauces & Spread		
VH Soya Sauce 450ml	NO	Conagra Foods Canada Inc.
HEINZ Tomato KETCHUP 1L	NO	Heinz Canada Inc.
Canton Vegetable Delight 990ml	NO	Produits Ronald Inc.
French's Yellow Mustard 400ml	NO	Reckitt Benckiser Inc.
Classics Dressing 250ml	NO	Kraft Canada Inc.
Miracle Whip Dressing Sauce 1L	NO	Kraft Canada Inc.
Hellmann's Mayonnaise 1L	NO	Bestfoods Canada Inc.
Regular Sugar 2kg	NO	Lantic Sugar Ltd.
Sifto Coarse Salt 2kg	NO	Sifto Canada Inc.
Sifto Table Salt 1kg	NO	Sifto Canada Inc.
PC Ketchup 1 L	YES	Sunfresh Ltd.
PC Original Whipped Salad 950ml	YES	Loblaws Inc.
6. Baby Products & Foods		
Pampers Baby-dry 48count	NO	Sesame Workshop
Huggies 60count	NO	Kimberly-Clark Inc.
Heinz Mixed Cereal 227g	NO	Heinz Canada Inc.
Dove Baby Soap	NO	Unilever
Pablum Soya Cereal 100g	NO	Pablum Canada
Heinz Blueberry 213ml	NO	Heinz Canada Inc.
Farley's Biscuits 300g	NO	Heinz Canada Inc.
Heinz All-In-One 227g	NO	Heinz Canada Inc.
Johnson&J Baby Shampoo 444ml	NO	Johnson & Johnson
Heinz Toddier Biscuit 180g	NO	Heinz Canada Inc.

7. Health & Beauty Aid		
Pantene Shampoo 400ml	NO	Procter & Gramble lnc.
Alberto Hairspray 300ml	NO	Alberto-Culver Canada lnc.
Fruictis Style 300ml	NO	Garnier Canada lnc.
Head & Shoulder 400ml	NO	Procter & Gramble lnc.
Finesse Extra Body Shampoo 300ml	NO	Unilever
Dove All Day 354ml	NO	Unilever Canada
Scope Mouthwash Original Mint 1L	NO	Procter & Gramble lnc.
All-In-One Toothpaste 90ml	NO	Church & Dwight Co.
Gillette Shaving Cream 60g	NO	Gilletle Canada
Colgate Total 75ml	NO	Colgate-Palmolive Canada lnc.
Dove Soap 2x100g	NO	Lever Pond's
8. Frozen Food		
Delissio Pizza 840g	NO	Kraft Canada lnc.
Arctic Garden Thai Style 1.75kg	NO	Carriere Foods lnc.
Arctic Garden California Style 2kg	NO	Carriere Foods lnc.
Egg6 312g	NO	Kellogg Canada lnc.
Quebon Classic 2L	NO	Good Humor
Ice Cream 4L	NO	Briska lnc.
Nestle Parlour 2L	NO	Nestle Canada lnc.
Minis Ice Cream 100ml	NO	Good Humor
Super C Pizza Lunch 1.2kg	YES	Briska lnc.
Super C Buttermilk Pancake 310g	YES	Briska lnc.
9. Paper Towel, Tissue & Pet Supplies		
Royale Paper Towel 20RL	NO	Irving Tissue Corporation
Cottonolle Paper Towel 30RL	NO	Scott Paper Ltd.
Puffs Plus Lotion 144FE	NO	Hallmark Licensing lnc.
Scotties Tissue 150 FE	NO	Scott Paper Ltd.
Kleenex Tissue 230FE	NO	Kimberly-Clark lnc.
Cat Chow 4kg	NO	Ralston Purina Canada lnc.
Puppy Chow 8kg	NO	Ralston Purina Canada lnc.
Dog Chow 2kg	NO	Nestle Purina Petcare
Super C Bathroom Double Tissue 24un	YES	Briska lnc.
Super C Facial Tissue 250un	YES	Briska lnc.

10. Soup / Canned Foods		
Aylmer Whole Tomato 796ml	NO	De Nabisco
DelMont Fresh Cut 284ml	NO	DelMont Corporation
Pastene Diced Tomato 796ml	NO	Pastene Inc.
Mushroom Pieces Canned 284ml	NO	Sunfresh Ltd.
Green Giant Beans 398ml	NO	General Mills Canada Corporation
Det Monte Fruit Cocktail 796ml	NO	DelMonte Corporation
Super C Mais 398ml	YES	Briska Inc.
Super C Tomatos 796ml	YES	Briska Inc.
Super C Small Peas 398ml	YES	Briska Inc.
11. Households		
Sunlight Detergent with bleach 3.3kg	NO	Unilever HPC-NA
Arctic Power 3.3kg	NO	Colgate-Palmolive Canada Inc.
Fleecy FreshAir 5L	NO	Colgate-Palmolive Canada Inc.
Tide Detergent Power 3.4kg	NO	Procter & Gramble Inc.
Purex 3.78L	NO	The Dial Corporation
Downy April Fresh 3L	NO	Procter & Gramble Inc.
Sunlight Disgwasging Liquid 750ml	NO	Unilever Canada
Pamolive Diswashing Liquid 625L	NO	Colgate-Palmolive
Five Rose Flour 2.5kg	NO	Five Rose Kitchens Canada Inc.
Robin Hood Flour 10kg	NO	Robin Hood Multi Foods Inc.
Mazola Corn Cooking Oil 2L	NO	ACH Food Companies Inc.
Canola Harvest Oil 1.89L	NO	Canbra Foods Ltd.
Super C Maize Oil 2L	YES	Briska Inc.
Super C Dishwashing 850ml	YES	Briska Inc.
Super C Laundry Detergent 3.6kg	YES	Briska Inc.
Super C Fabric Softener 3.6L	YES	Briska Inc.
PC Fabric Softener 3L	YES	Sunfresh Ltd.
PC Laundry Detergent 3.4kg	YES	Sunfresh Ltd.

Appendix 2: Sample Labels of Regular and Sales Prices

Appendix 3: Three Sample Supermarkets